ROADS AND STREETS

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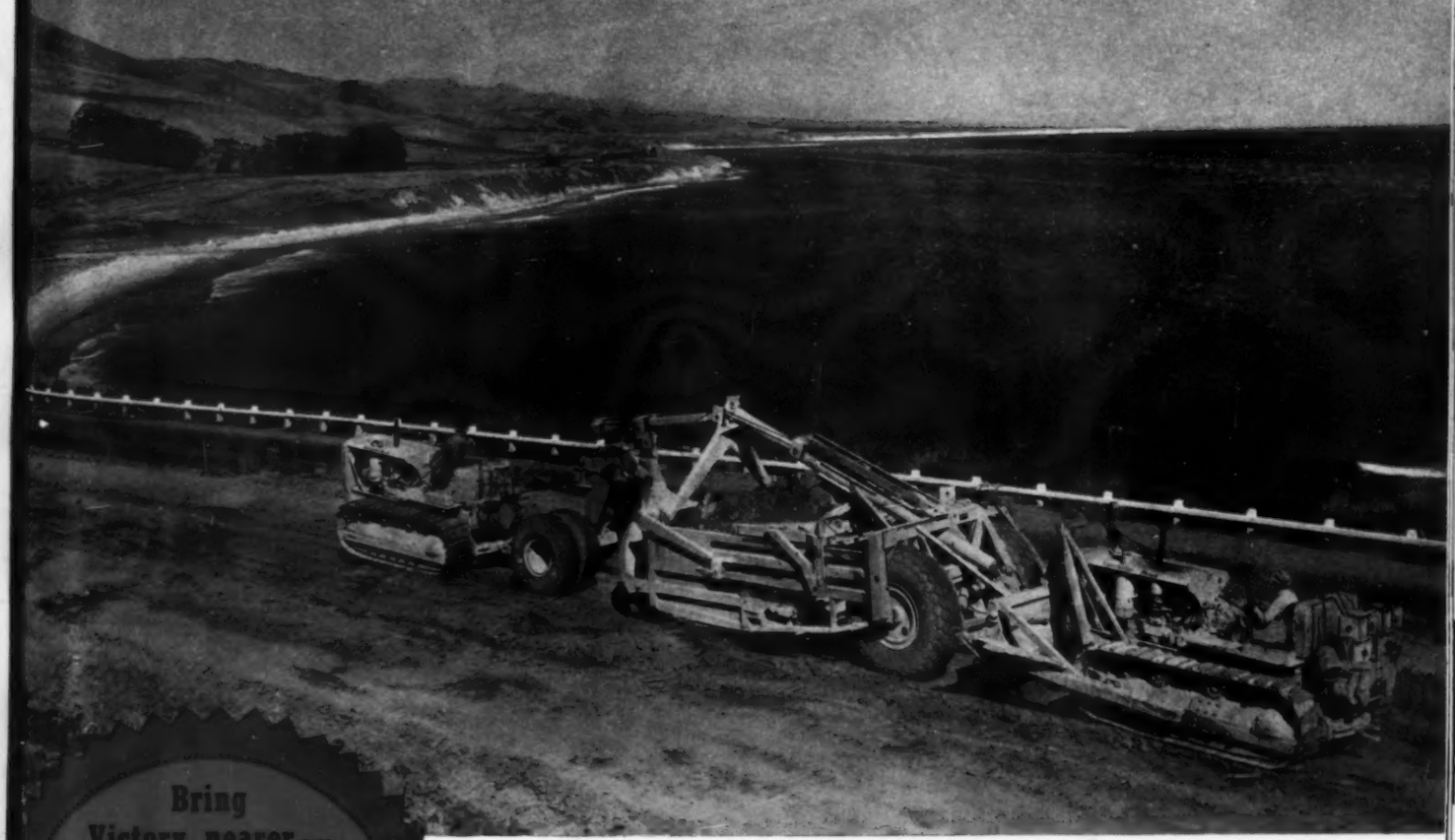


Timken Bearing Equipped Letourneau Model RU Carryall Scraper and "Caterpillar" Diesel Tractors working on U. S. Highway 101 along the California coast. The scraper is shown being pusher-loaded to 30 heaped yards.

Bring Victory nearer—meet post-war conditions confidently; redesign your construction equipment for higher speed; greater endurance. Use more Timken Bearings.

HELP ASSURE VICTORY

y War Bonds. Conserve Rubber. Eliminate Un-cessary Travel. Use the Telephone Only When portant. Salvage All Scrap and Waste Material.

The more Timken Tapered Roller Bearings any kind of machine contains, the closer it will come to attaining modern Victory performance standards; and the lower its costs of operation and maintenance —important advantages for the contractor in peace-time.

Moreover, Timken Bearing Equipped machines *sell* better as well as *perform* better, because the name "TIMKEN" means "Quality" to equipment buyers the world over—a hint for every designing engineer who has his employer's best interests at heart.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

MORE YEARS OF LIFE FOR YOUR BLACKHAWK HYDRAULICS

"I'll Protect Your POWER-PACKERS and Blackhawk Hydraulic Rams"

HEED THIS WARNING — and the Blackhawk Hydraulic Units on your snowplows and other road machines will continue to give you dependable, trouble-free service year in and year out.

Do not use hydraulic brake or shock absorber fluids, alcohol, glycerine, castor oil, etc. These fluids damage packings, dissolve the "sizing" which seals the pores in cup leathers, and corrode the surface of valve seats and cylinder walls.

Use *nothing* but *Blackhawk Hydraulic Jack Oil* which is especially selected to assure quick, free action in cold weather. The use of substitutes seriously cuts down the life of your Blackhawk Hydraulic Rams and Power-Packer Controls.

All your equipment is too valuable today — too hard to replace — so heed not only this warning concerning Blackhawk units, but the service suggestions of other manufacturers as well.

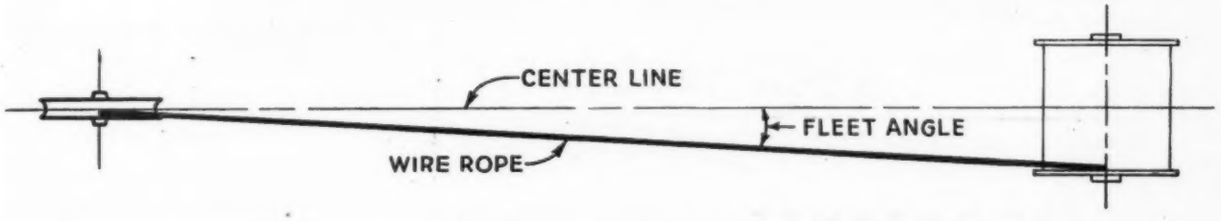
A Product of **BLACKHAWK MFG. COMPANY**
DEPARTMENT RS **MILWAUKEE, WISCONSIN**

Use only **Blackhawk Hydraulic Jack Oil — available in 1 Quart, 1 Gallon, 5 Gallon and 34 Gallon Drums.**

BLACKHAWK ...WORLD'S LARGEST MANUFACTURER OF HYDRAULIC EQUIPMENT

Keep fleet angles under 3 deg.

for best service from wire rope



The "fleet angle," illustrated above, is an important consideration when locating a main sheave in reference to a winding drum. If this angle is too large, there will inevitably be side-wear on the rope as it passes diagonally from the outside edge of the drum across the sheave.

Experience has shown that best results are obtained when the fleet angle is not greater than 1½ deg., with a smooth-faced drum, and not greater than 2 deg. with a grooved drum. When the fleet angle exceeds a maximum of 3 deg., wire rope service life is materially reduced. If these recommended fleet angles are followed, you will get a lot of extra service from wire rope.

Another worth-while maintenance precaution is proper alignment of sheaves. Proper sheave alignment seems like such a small matter that it may be overlooked in busy times—yet it can add greatly to wire rope service life.

To line up two sheaves properly, simply adjust them so that the rope runs straight from one to another and seats squarely in the center of each sheave groove. Even a slight misalignment can cause a great deal of wear between the rope and the shoulder of the sheave.

On certain types of work it is well to check sheave alignment from time to time during operation, to catch and correct any deviation from true alignment. For example, on timber-mounted drag-scrapers and slack-line excavators, the sheaves are apt to slip out of alignment due to a loosening of the mounting in the wood.

Mining machines—loaders, slushers and tugger hoists—should also be frequently inspected. Wire rope that operates in a mine is subject to severe wear under the best of conditions. Help the rope with maintenance precautions, wherever possible.

A third practical suggestion is to inspect the wire-rope system of clam-shell buckets for wobbly sheaves and to replace worn sheave bearings or worn axles where necessary. A wobbly sheave, or a badly worn sheave, can greatly reduce the service life of a wire rope.

Bethlehem Wire Ropes for all Purposes

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

ROADS AND STREETS

Vol. 85, No. 12 ▾ December, 1942

ECA

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

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CALLING ALL CONTRACTORS AND OPERATORS!

Enlist

TO CONSERVE CONSTRUCTION EQUIPMENT

Show others that you are helping to make your equipment last longer and work faster. Regardless of the type or make of your equipment, if you will sign and mail the pledge form below, we will send you a colorful red, white and blue emblem to put on your machine (or it can be used on a truck or passenger car). Then it's up to you to practise what you have pledged—it's one big way you can contribute to victory.

Get This Emblem. Sign This Pledge

New Emergency "FIX-IT" HANDBOOK for LORAIN OWNERS

To assist our customers in keeping their machines in operation, we have just prepared a 24-page handbook of suggestions and ideas on how emergency repairs may best be accomplished. Indicate on the pledge form if you want us to send you a copy.

THE THEW SHOVEL COMPANY, *Lorain, Ohio*

I hereby pledge that I shall do all in my power to prolong the life of any construction equipment in my ownership or care regardless of type or make.

I realize that it is my responsibility to avoid time-consuming delays caused by mechanical breakdowns and will see that frequent inspections are made and that necessary adjustments and repairs are promptly taken care of.

I will avoid waste of parts and materials and will eliminate any abuse of my equipment due to non-recommended operation.

Signed _____

Street Address _____

City _____ State _____

"FIX-IT" Handbook Wanted _____

Lorain Model No. _____ Serial No. _____

HERE'S WHAT YOU NEED *for that* PAVING BREAKER JOB

C7

C9

C10

ASSUMING that you already have a good compressor, you will want to select the right Cleveland Paving Breaker. Model C7 is the right tool for the average job. It weighs 80 lbs., and two C7's can be run from a Number 85 compressor. If the work is heavier, you may want to try out the C9, which sells at the same price as the C7, weighs two pounds more, but uses no more air. C9 is the slugger that is a winner in the toughest, reinforced, well-seasoned concrete. For the light job, for trimming, etc., you will select the small No. C10, the little fellow with the big wallop. Three C10's can be run from your No. 85 compressor. ★ Then for the accessories—"Clevaloy" chisels, moils, and miscellaneous paving breaker tools cost you a little more, but save money in the long run. Usually the 14" narrow chisels are selected. They cut more than moils, but cost no more. For air hose, specify Cleveland "Veribest"—It's tough and will stand the service. Costs no more than other first-class hose. Connect it with Cleveland Type "A" hose couplings—quick-acting, durable, and they don't waste your air. ★ Send for Bulletin 128 that tells you how to get the most work out of paving breakers at the least cost.

★

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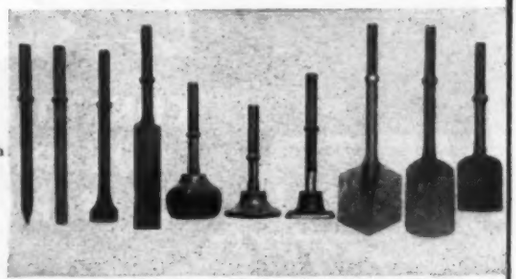
Whitehall Machine & Tools, Ltd., Galt, Ontario



Moil Chisel | Narrow Chisel | Wide Blade | Digging Blade | Sheeting Driver | 7" Tamper Bar | 5" Tamper Bar | Clay Blade | Clay Spade | Asphalt Cutter

The CLEVELAND ROCK DRILL CO.

Subsidiary of The Cleveland Pneumatic Tool Company

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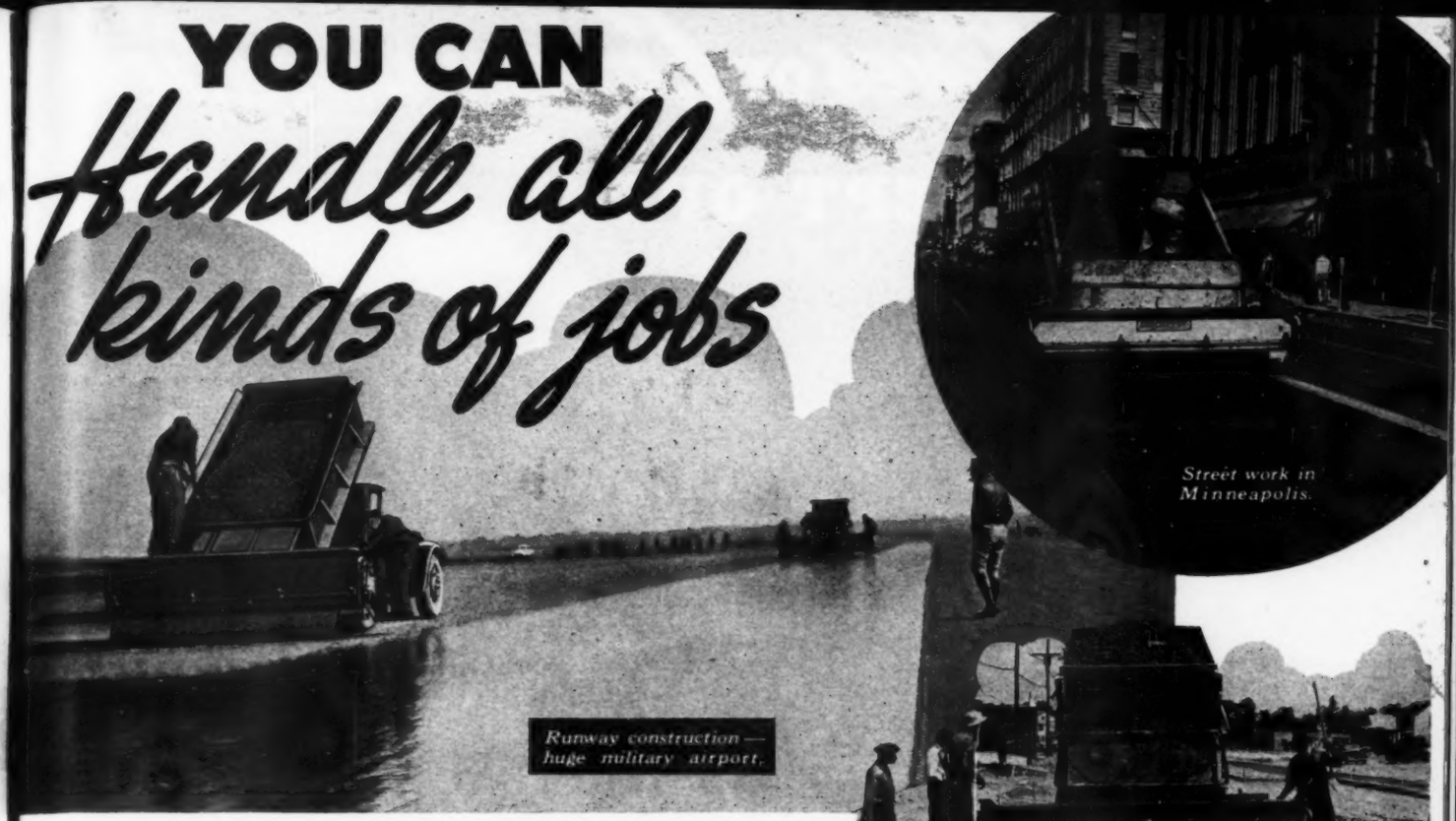
LEADERS IN DRILLING EQUIPMENT

YOU CAN *Handle all kinds of jobs*



Runway construction — huge military airport.

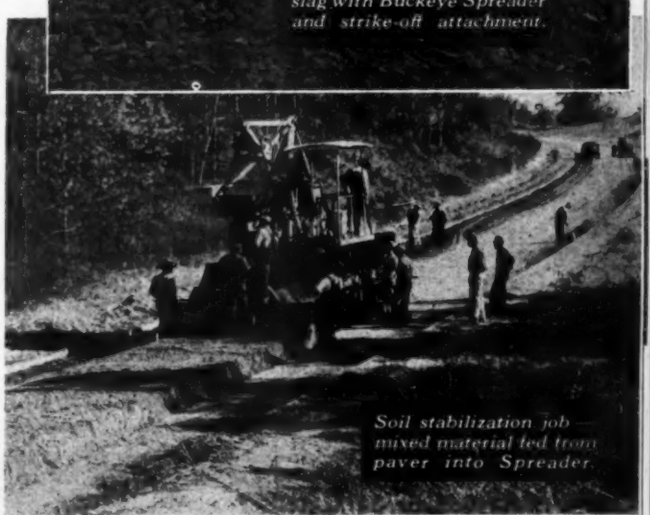
Street work in Minneapolis.

with a BUCKEYE SPREADER!

ACCURACY plus versatility makes the Buckeye Spreader an ideal machine for maintenance and construction of roads, streets and runways. This machine will handle everything from a fine sprinkle of sand up to a heavy course of rock, and with a strike-off attachment will put down courses up to six inches deep.

Transmission-driven feed roll is synchronized with truck speed and operates forward or reverse. Wheels are well in from end of box to permit spreading close to shoulders or obstruction. Spiral distributor, available when desired, feeds even wet or slightly tacky material to ends of box. Flow stops without dribble by manual control, or automatically when truck stops. These and other construction features that provide as high as 98-99% accuracy described in Buckeye Spreader Bulletin. Write for your copy.

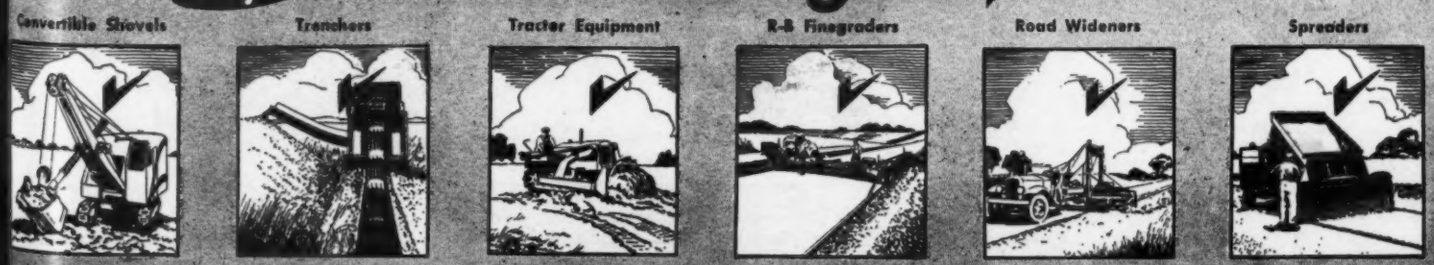
BUCKEYE TRACTION DITCHER COMPANY, Findlay, Ohio



Spreading heavy course of slag with Buckeye Spreader and strike-off attachment.

Soil stabilization job — mixed material fed from paver into Spreader.

Built by Buckeye ✓



WINTER *Lines of Communication* MUST BE KEPT OPEN!

PRACTICAL SUGGESTIONS FROM FWD TO HIGHWAYMEN ON HOW TO GET THE MOST IN PERFORMANCE FROM FWD SNOW CLEARING TRUCKS . . .

In cooperation with the aims of the U. S. Truck Conservation Program, FWD lists here a few practical suggestions to enable highway departments to get the most in performance with minimum maintenance out of their FWD snow removal trucks:

CONSERVE TIRES—snow removal truck operators are universally agreed that single tires are best in snow removal service. The use of single tires of the same size on all four wheels not only conserves rubber but also reduces excessive differential action, thus prolonging the life of the truck. Closely spaced tire chains — not emergency chains — should be used on all four wheels, for maximum traction and least slippage and damage to tires.

CARE OF ENGINE — change engine oil frequently enough based on total hours of operation. Keep cooling system clean and free of rust. Control engine temperature with a radiator hood or automatic shutter.

STORING THE TRUCK — sub-zero temperatures make lubricants too stiff and solid, cause steels to become brittle. House all your trucks when not in use — avoid outdoor storage for longer truck life.

INSPECT YOUR TRUCKS — periodically and check for needed replacements — take advantage of FWD's principle of progressive interchangeability of improvements and vital parts.

SEE YOUR FWD BRANCH OR DEALER

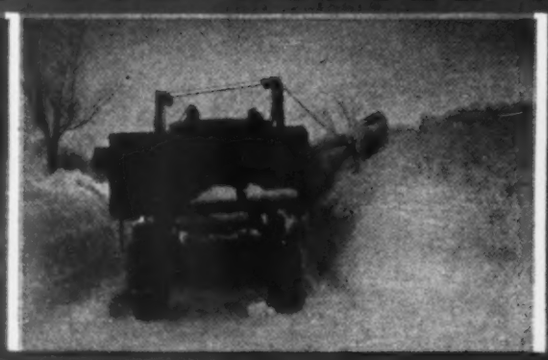
The entire FWD organization of factory branches, FWD dealers, and district servicemen are all pledged to help you get the most out of your trucks by aiding your program of preventive maintenance. Call on them frequently for sound maintenance advice and skilled service.

THE FOUR WHEEL DRIVE AUTO CO., *Clintonville, Wisconsin*

Canadian Factory: KITCHENER, ONTARIO

FWD HINTS FOR WINTER MAINTENANCE

Night and day hundreds of FWD snow removal trucks keep highways clear so that vital wartime transportation can be carried on without interference.



Single tires instead of duals and plenty of chain make the ideal snowplow combination — one which does the job and conserves the truck.

House trucks in warm quarters when off the and when servicing. Sub-zero temperatures lubricants too solid, cause steel to become Avoid outdoor storage for longer truck

OPEN ROADS ARE VITAL TO WARTIME TRANSPORTATION . . . FWD SNOW CLEARING TRUCKS BREAK WINTER'S BLITZ — FROM THE ATLANTIC TO THE YUKON

The ability to smash through the deepest drifts — to knife its way through hard packed snow and ice — the full power and traction of four driving wheels — make the FWD four-wheel-drive truck the number one choice of highwaymen for snow removal service.

FWD

TRUCKS

—THE PREFERRED TRUCK FOR FAST, LOW-COST SNOW-CLEARING

Hundreds of FWD's, similar to this model—fitted with mounting equipment and snowplows, are in action, fighting snow after a busy spring and summer on regular highway maintenance work.

THE FOUR WHEEL DRIVE AUTO CO.

Clintonville, Wisconsin — Canadian Factory: Kitchener, Ontario

Protect PRECIOUS WAR CARGO AGAINST SKID ACCIDENTS

CALCIUM CHLORIDE MAKES ABRASIVES *DIG DEEP—HOLD TIGHT—GIVE TRACTION!*

UNTREATED grits brush off easily and have to be replaced. So, if you want most effective skidproofing results when you spread abrasives, see that they are treated with calcium chloride. You save money, too, since treatment makes abrasives go three times as far. Tests show that proper treatment saves enough grits to reduce the cost of each application by $6.60 per mile of 18 foot road at the conservative abrasive cost of $1.50 per ton applied.

Truck loads are heavier this year and cargos vital to the war effort. A truck load of vital parts lost can tie up a whole production line. Road men must see to it that such losses do not occur through hit-or-miss ice control methods. They will cut costs, save gas and tires, reduce labor and provide better skidproofing with calcium chloride treated grits. Methods are fully explained in Bulletin No. 27—available on request. Write for your copy today.

CALCIUM CHLORIDE ASSOCIATION, 4145 Penobscot Bldg., Detroit, Mich.

CALCIUM CHLORIDE

FAST • POSITIVE • ECONOMICAL

MAKES ICY ROADS SAFER

SAVES UP TO $6.00 A MILE EACH TREATMENT

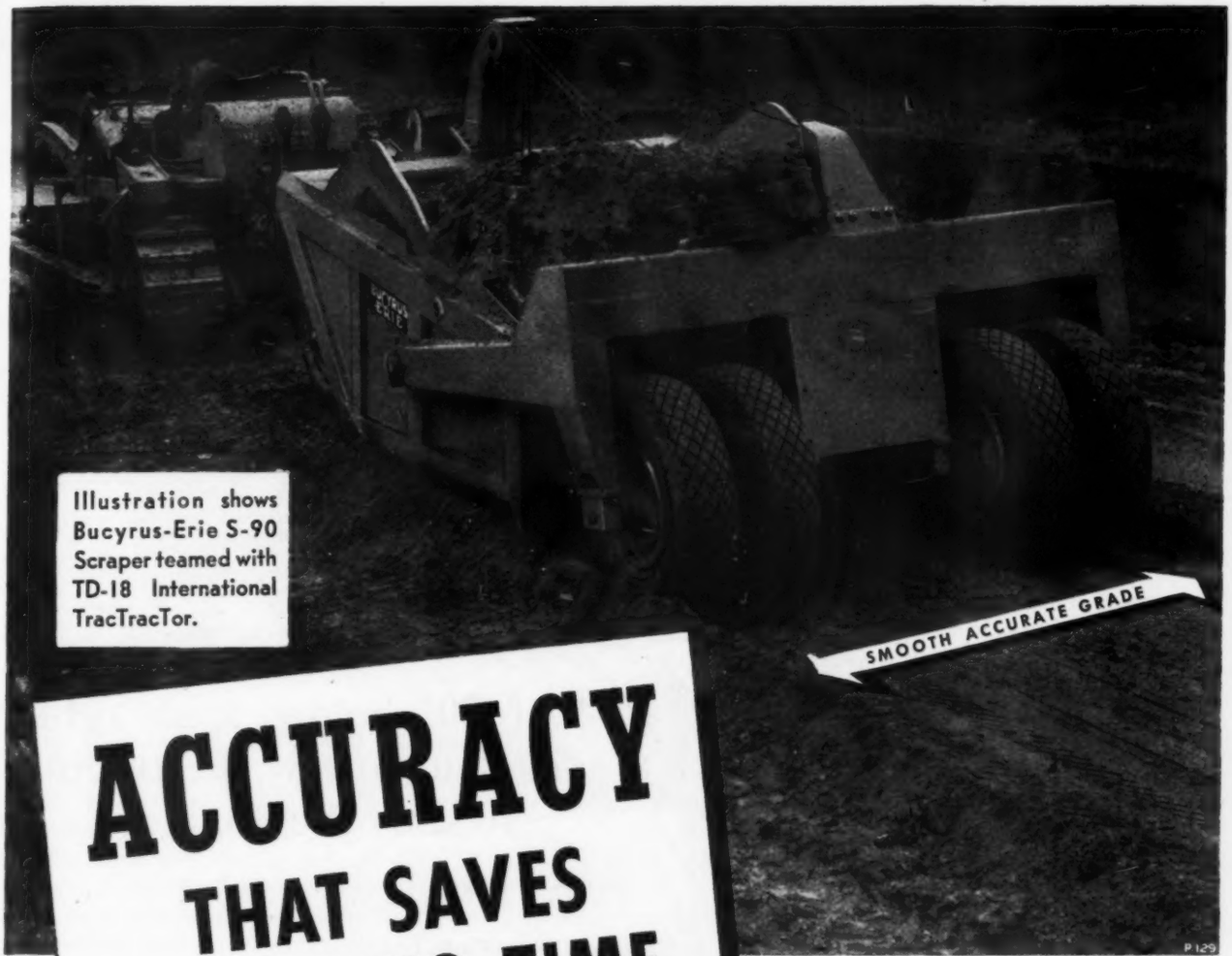
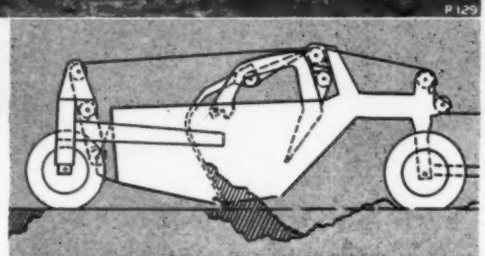


Illustration shows Bucyrus-Erie S-90 Scraper teamed with TD-18 International TracTracTor.

ACCURACY THAT SAVES FINISHING TIME

THE accuracy of Bucyrus-Erie Scrapers speeds wartime road improvements and maintenance. Two-line operation gives independent control of the cutting edge so that you can hold an accurate grade in both cutting and spreading. This reduces (or eliminates) work that has to be done with finishing tools. The double-curve cutting edge breaks up the dirt as it enters the bowl. In dumping, this broken-up dirt rolls out clean (by positive rolling ejection) so that it can be spread in neat, even layers. Power demand is so low that dumping can usually be done in higher tractor gears. Because the operator has plenty of power at his control he can dump where he wants to, when he wants to, and as he wants to. He also has full visibility at all times so that he can see what he's doing and can hold the blade exactly where he wants it. Bucyrus-Erie Co., South Milwaukee, Wis.



ACCURATE CONTROL — Accurately controlled cutting edge picks up dirt from high spots and fills in the low spots.

FINISH STEEP SLOPES — They cut, spread or finish easily on sides slopes because of their exceptionally low center of gravity.

BUCYRUS ERIE TRACTOR EQUIPMENT

SEE YOUR INTERNATIONAL TRACTRACTOR DISTRIBUTOR

"Economical Operation ...netted us dividends ...thanks to RING-FREE"

SHAFFER & MAX
Silk Waste Remnants ~ Textile Machinery
ALLENTOWN, PA.
R.J.Fritz Co.
710 N. Quincy St.
Allentown, Pa.
Gentlemen:
Our fleet of equipment consists of eight tractors and five passenger cars. Our tractors pull heavy loads of machinery from Allentown, Pa., to Florida and as far north as Province of Quebec, Canada. The first experience we had with Ring-Free Oil convinced us that this was the oil for our equipment.
On our trips to Canada, during the winter months at 30 degrees below zero, with other oils, we had to tow the tractors to start the engines, which cost us $5.00 per tow each morning, until we were asked to use Ring-Free Oil. To our amazement we were able to start the engine after that with the starters. This immediate saving was the start of an economical operation which has netted us dividends ever since.
All of our equipment is now lubricated by Ring-Free Oil and Grease. Thanks to Ring-Free.
Sincerely yours,
Shaffer & Max
O. Casciotti

"At 30° below, with other oils, had to tow the tractors to start the engines."

THE EIGHT TRACTORS in the Shaffer & Max fleet must haul heavy textile machinery from Allentown, Pa., as far south as Florida and as far north as Quebec.

"On our trips to Canada," writes O. Casciotti, service manager, "during the winter months at 30 degrees below zero, with other oils, we had to tow the tractors to start the engines, which cost us $5.00 per tow each morning until we were asked to use RING-FREE.

"To our amazement we were able to start the engine after that with the starters. This immediate saving was the start of an economical operation which has netted us dividends ever since. All of our equipment is now lubricated by RING-FREE."

What RING-FREE has done for others, it can do for you. Write us!

MACMILLAN PETROLEUM CORPORATION
50 West 50th Street, New York • 624 South Michigan Avenue, Chicago • 530 West 6th Street, Los Angeles

MACMILLAN
RING-FREE
MOTOR OIL

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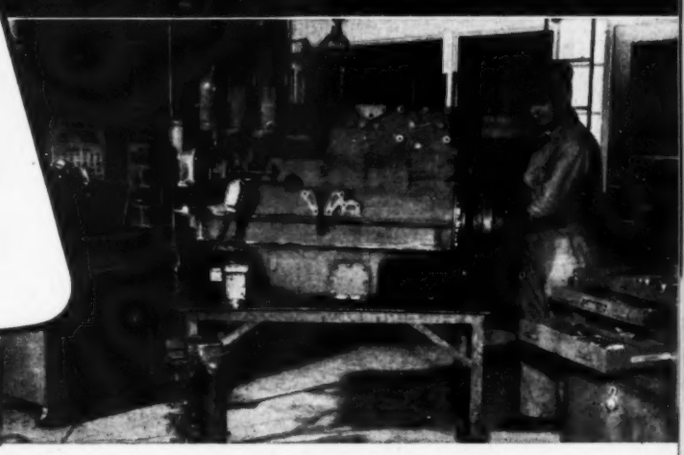
YOUR SALVATION INTERNATIONAL SERVICE IN 1943!



NEW International TracTracTors, Wheel Tractors, and Power Units will not be available for civilian use in 1943 except in very limited quantities. The Armed Forces are getting most of them.

But of this you can be sure: the International Industrial Power dealer will render you International Service to the very limit of his ability. His service facilities, which you learned to depend on in peacetime, have been enlarged, improved, and broadened to meet wartime needs. His shop is busier and better equipped than ever. His mechanics and servicemen are meeting—and solving—new problems of overhaul, reconditioning, and repair and doing a bang-up job of it. His stocks of Genuine IHC Parts are in A-1 shape.

And yet, Service as the International Industrial Power dealer thinks of it, means more than repairing tractors and equipment and supplying you with the repair parts you want when you want them. He's a sound, practical consultant on your equipment and construction problems. He knows machinery and its application to your specific jobs. He knows many a short cut in getting jobs done. He can help you get maximum output from your equipment in this critical time.

More work and longer life from every machine is what both of you are shooting for in 1943. Keep in close touch with him and work out your problems together.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

INTERNATIONAL Industrial Power

MILITARY airports, — nests for Uncle Sam's war birds, — are today built faster and better even under adverse conditions — than was dreamed possible a short time ago. The great advances made in methods, engineering and equipment are responsible.

Use of the SEAMAN PULVI-MIXER is a striking example of modern methods — an example Uncle Sam was quick to use in our country's extensive war program covering world-wide airport and road construction.

Whatever the job calls for — soil-cement, bitumen, calcium chloride, or any stabilization process with or without binder, — in place mixing operations are handled with a Seaman more quickly and more thoroughly.

With the very thorough mixing obtained with the SEAMAN PULVI-MIXER, roads and airports cost less to construct, stand up longer and require less maintenance. Recognized engineering authorities now realize this fact.

Contractors! Take a tip from Uncle Sam. Investigate the SEAMAN PULVI-MIXER now!

THE SEAMAN PULVI-MIXER

SEAMAN MOTORS

305 N. 25th STREET • MILWAUKEE, WIS.

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WESTERN UNION

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SYMBOLS

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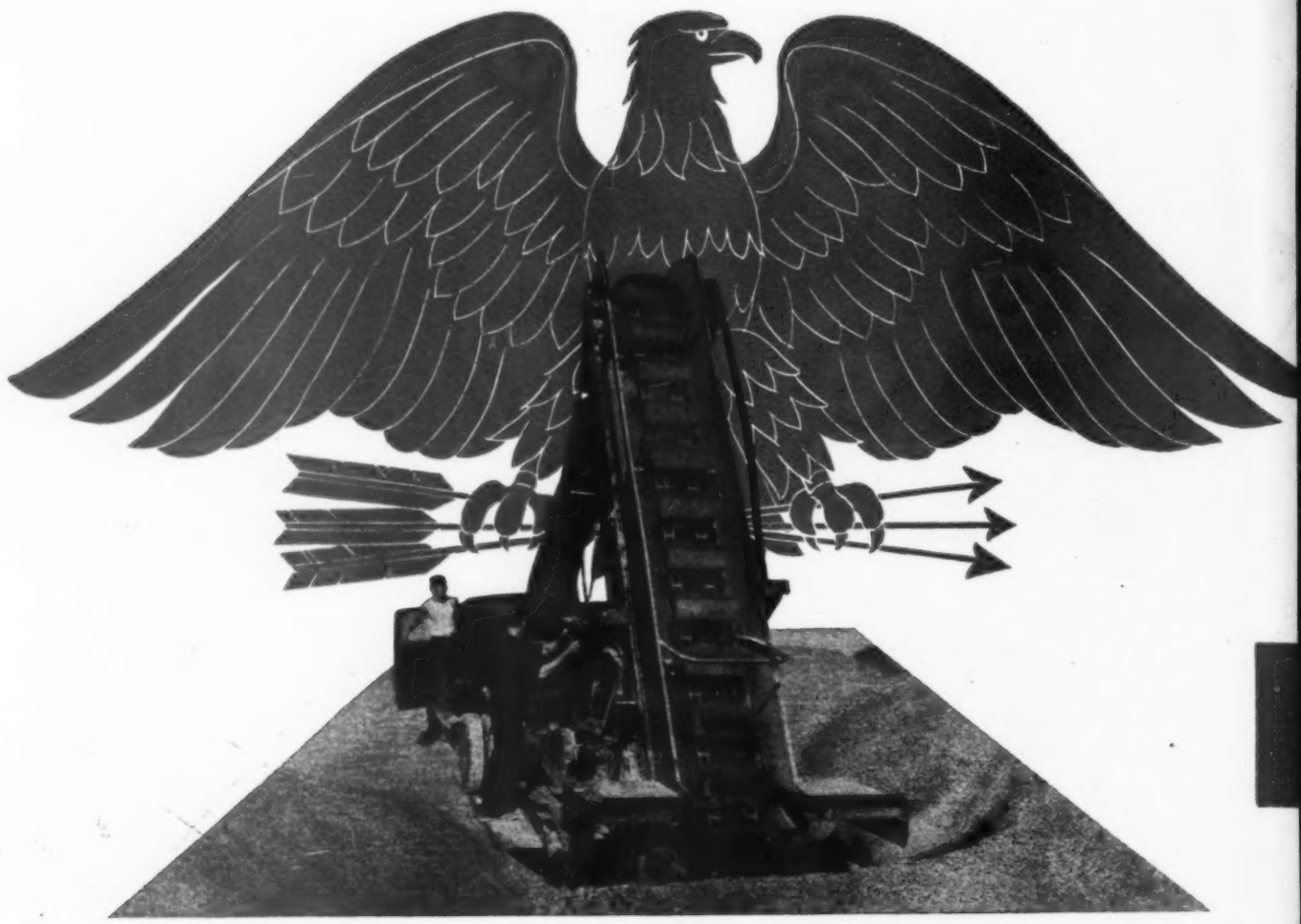
THE MARION STEAM SHOVEL COMPANY=

MARION OHIO=

AS CHAIRMAN OF THE U. S. MARITIME COMMISSION BOARD OF AWARDS, I TAKE PLEASURE IN ADVISING YOU THAT THE BOARD, IN RECOGNITION OF YOUR OUTSTANDING PRODUCTION ACHIEVEMENT, HAS AWARDED YOUR PLANT THE MARITIME "M" PENNANT, THE VICTORY FLEET FLAG AND MARITIME LABOR MERIT BADGES FOR ALL YOUR EMPLOYEES=

H L VICKERY COMMISSIONER US MARITIME COMMISSION.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE



BARBER-GREENE OWNERS

AND THE

WAR

You Barber-Greene owners are fortunate in having machines which have proven their ability to last for years of service. During the present emergency, it is important that every precaution be taken to keep your Barber-Greene in good condition. The delivery of repair parts is becoming uncertain. Many broken parts are due to carelessness, or improper maintenance. It is impossible to outline here all of the points to be watched. Good, sound horse sense must be exercised.

THE IMPORTANCE OF LUBRICATION

Nothing can add to the life of the machine more than thorough lubrication of the moving parts, properly executed at the proper intervals with the correct lubricants. A breakdown resulting from improper lubrication is inexcusable. Correct and systematic lubrication can be maintained with little or no loss in operating time.

OPERATE WITHIN THE MACHINE'S CAPACITY

You will lay more road or handle more material in the long run by refraining from crowding your Barber-Greene. A good operator who has the "feel" of his machine can immediately sense an overload. There are times when momentary overloads cannot be avoided, but for the long steady pull, operate within the machine's normal capacity.

KEEP YOUR MACHINE IN PROPER ADJUSTMENT

Make regular checks of all of the adjustable points on your Barber-Greene. Particularly notice chain slack and bearings. A chain which becomes too loose can climb the sprocket and seriously damage the machinery.

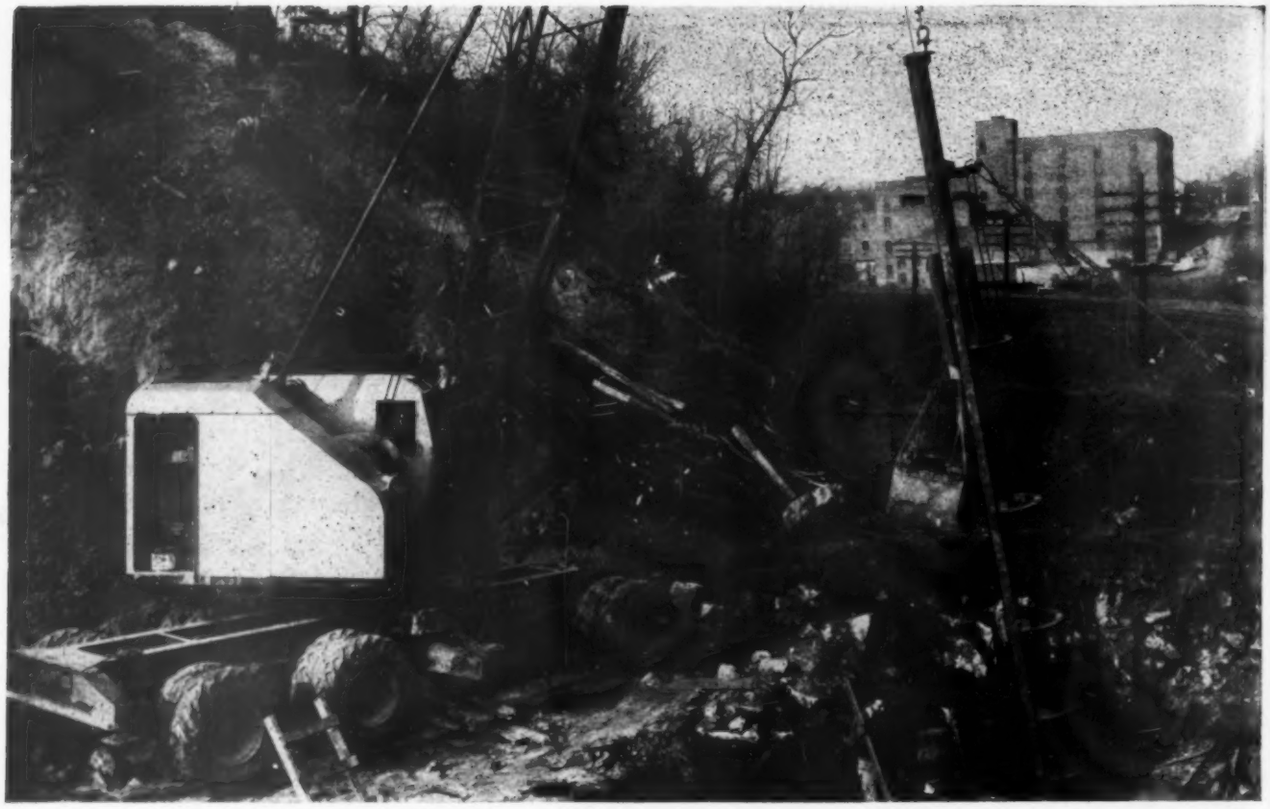
WATCH SUCH VITAL POINTS AS THE AIR CLEANER

Your Barber-Greene is equipped with the air cleaner suitable for the type of work done by the machine. Many Barber-Greenes operate in highly abrasive dust which can wreck an engine if it gets into the cylinders. Carefully follow the instructions on the air cleaner, oil filter, etc.

ALWAYS GUARD YOUR RUBBER BELT

Load the belt evenly. Have a hopper or some other arrangement for preventing large chunks from striking the belt at the loading end. Keep the belt properly aligned. Do not convey hot materials with your Barber-Greene Belt Conveyor unless it has a special "hot belt." (Even a special hot belt can be damaged from material above 300 degrees or by hot material which is discharged onto the belt conveyor when it is idle.)

BARBER-GREENE COMPANY, Aurora, Ill., U. S. A.



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SUPERCRANES are selling faster than we can build them. Still, now is a good time to find out how you can save with a SUPERCRANE. Ask for new Catalog.

GENERAL SUPERCRANES Conserve Vital Fuel, Man-Power and Machinery

Powered by one motor and controlled by one man the SUPERCRANE moves about freely on its pneumatic tires. Movement is much faster, with reduced wear on moving parts. Available as Crane, Clamshell, Dragline, Magnet and Pile Driver.

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Sizes: ½ to 2½ Cu. Yd.
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Associated with The GENERAL EXCAVATOR CO.

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HERCULES *IRONEROLLERS*
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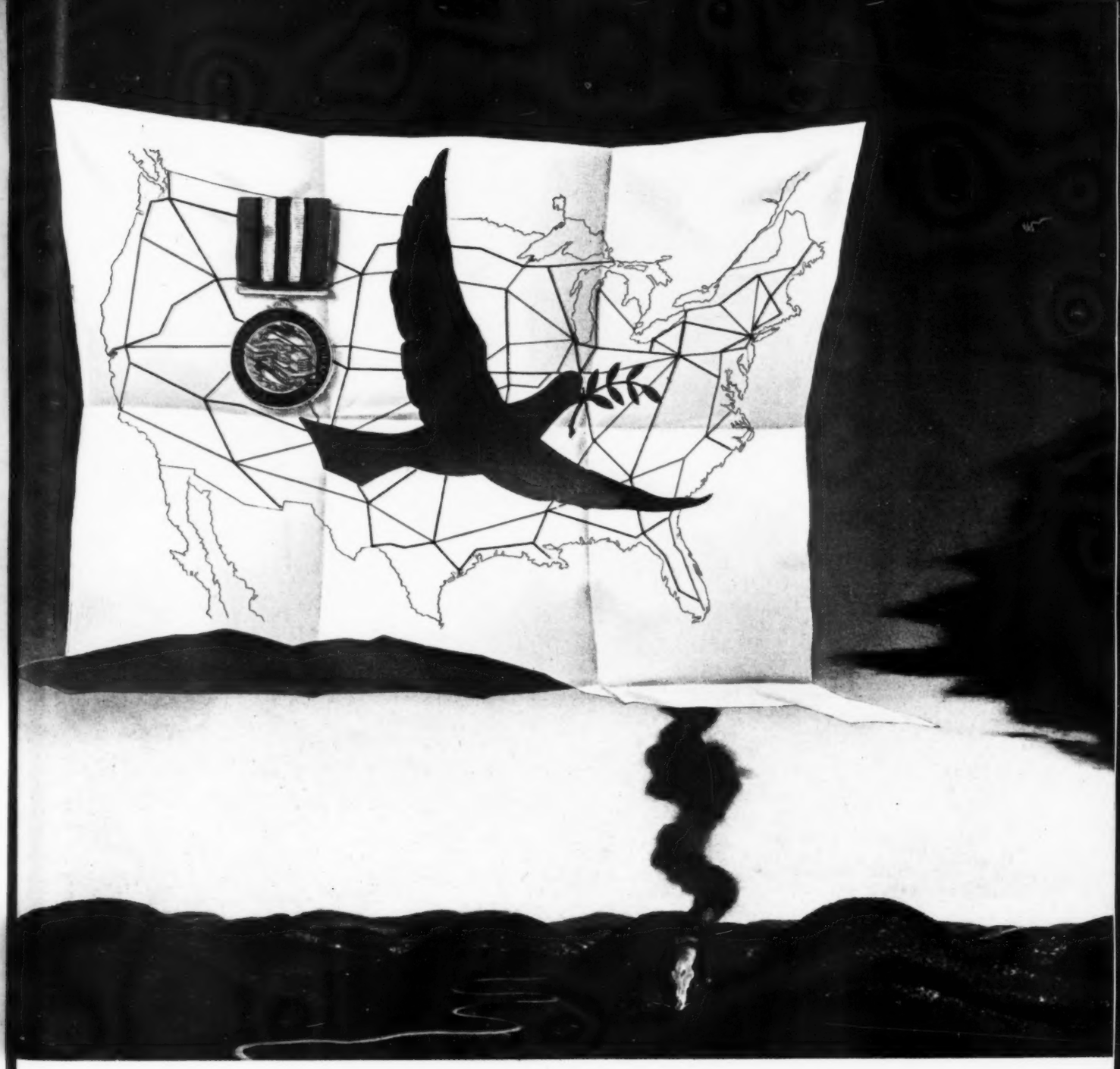
THE GENERAL EXCAVATOR COMPANY, Marion, Ohio



America built her Burma Roads in Peace

The spectacle of a friendly nation of half a billion people dangling from one thin, precarious, mountain-clinging supply line made the Burma Road probably the most famous military road of all time.

America, with but a quarter of the population of China, built the finest highway system in the world. That highway system today is paying the nation an unexpected "dividend." For the development of the American highways contributed to the growth of the American coal tar industry and the coal tar industry is now one of the important sources of highly-essential war materials for the nation.

Large quantities of coal tar that formerly went into roads are now being used to make pitch coke and carbon pitches that are important in aluminum manufacture . . . core pitches that help speed the casting of airplane and tank parts . . . naphthalene, from which is made one of the ingredients of flashless powder and of new-type paints for battleships . . . creosote to pressure-treat timber for piers and docks and for construction work, where it is releasing much-needed steel . . . tar acids for plastics . . . target pitch which is helping American marksmen learn to follow the flight of an enemy plane . . . and many other products.

Koppers is producing millions of gallons of coal tar for these purposes and processing it for the recovery of these vital war materials. In addition, it is still turning out huge quantities of road tar for the construction of access roads and airport runways and for the maintenance of existing highway surfaces.—Koppers Company, Pittsburgh, Pa.

Buy United States War Bonds and Stamps

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Trouble's ugly head will rear "as sure as shootin'" if your equipment is neglected. A machine run even one day longer than it should will be many times as expensive to repair . . . cost you plenty in lost production, too, and require considerably more critical material.

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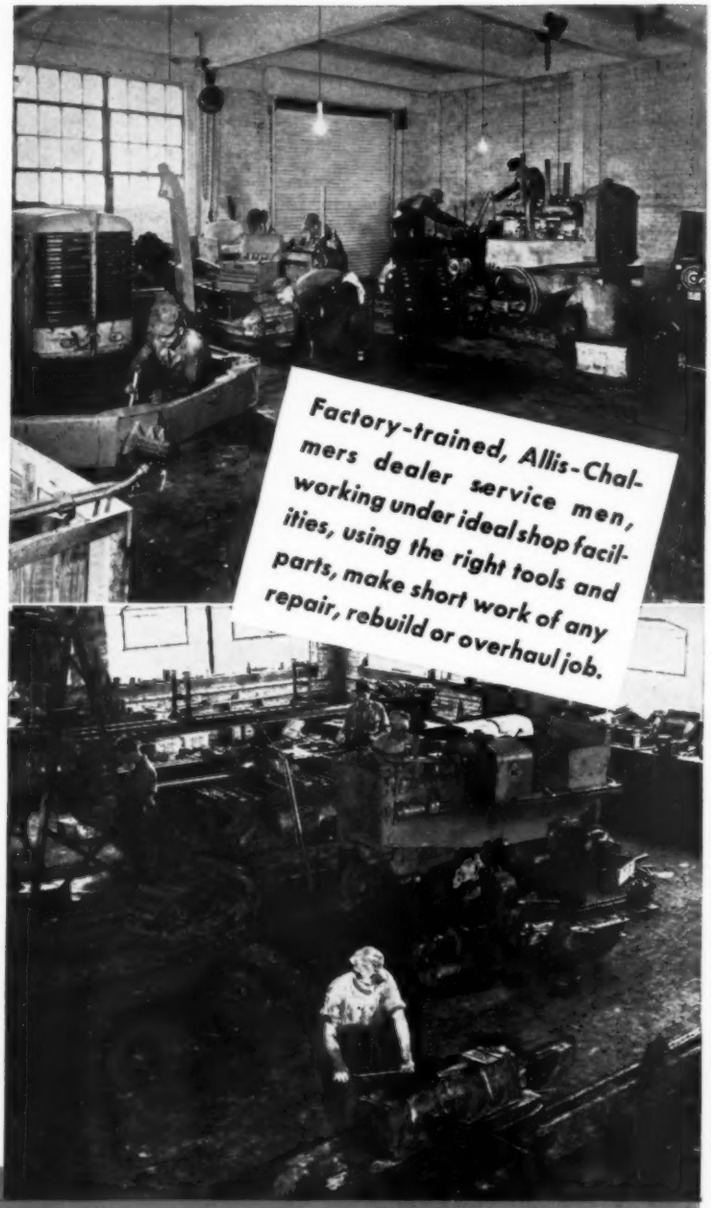
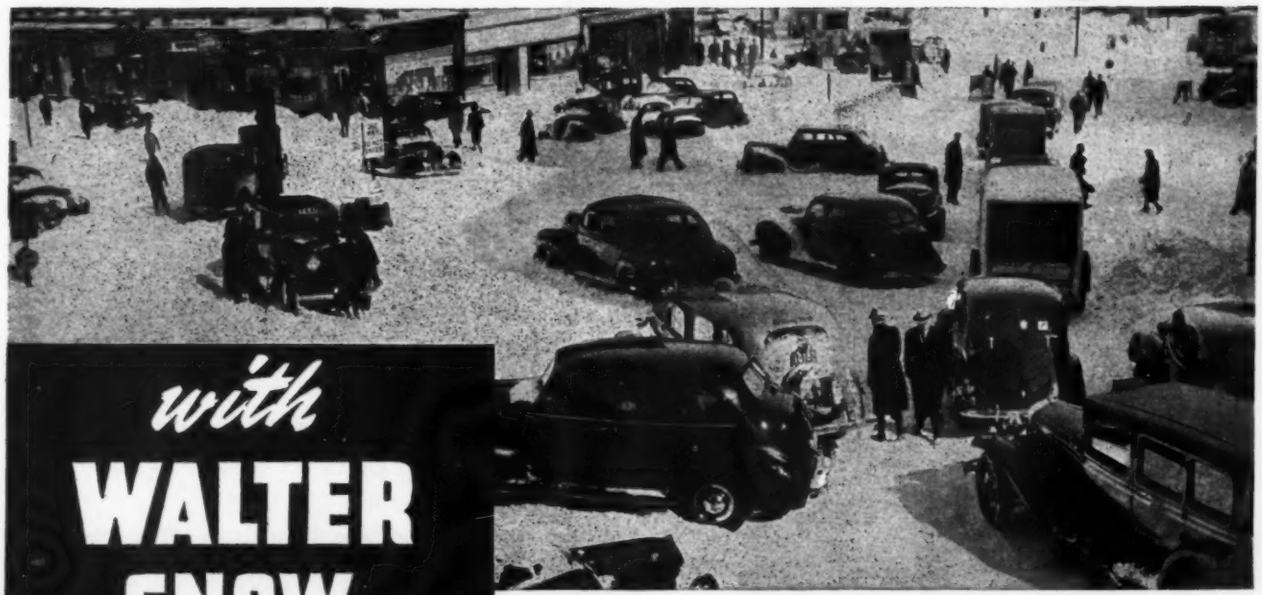

Factory-trained, Allis-Chalmers dealer service men, working under ideal shop facilities, using the right tools and parts, make short work of any repair, rebuild or overhaul job.

ALLIS-CHALMERS
TRACTOR DIVISION · MILWAUKEE · U.S.A.

THROW YOUR SCRAP INTO THE FIGHT!

Prevent Traffic Paralysis



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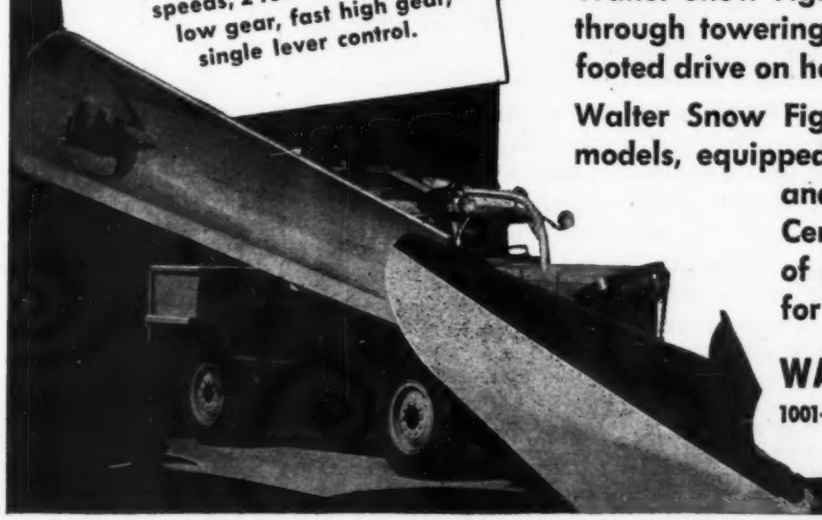
WALTER SNOW FIGHTERS

Walter Features:

Automatic Lock Torque Proportioning Differentials.

Suspended Double Reduction Drive with less unsprung weight, larger gear capacity and higher ground clearance.

Tractor-type transmission, 10-to-1 range, with 6 forward speeds, 2 reverse, powerful low gear, fast high gear, single lever control.



ANY traffic tieup in your community this winter can stop the flow of arms, men and military supplies on the very day they are needed most.

Be on your guard against traffic paralysis. Fight snow and ice to a finish with snow removal equipment specially designed for the job . . . WALTER SNOW FIGHTERS. With the super power and extraordinary four-wheel traction of Walter 4-Point Positive Drive behind your plows, the worst blizzard is quickly brought under control. This unfailing power-plus-traction gives Walter Snow Fighters their great blasting force through towering drifts and their steady, sure-footed drive on hard-packed or icy surfaces.

Walter Snow Fighters are available in many models, equipped with various types of plows and levelling wings, plus Walter Center Scraper, to meet the needs of every winter condition. Write for detailed literature.

WALTER MOTOR TRUCK CO.

1001-19 Irving Ave., Ridgewood, Queens, L. I., N. Y.

BUILT TO LAST★ AND MOVE DIRT FAST★★

★ BUILT TO LAST! Every working day for 17 years, a Wellman Bucket has unloaded crushed rock and sand for the Concho Sand and Gravel Co., Oklahoma City. In all that time (17 years) not one cent was spent for repairs or maintenance.

★★ FAST? "Our Williams digs and fills in rock and shale better than any other bucket ever used."—*F. F. Mengel Co.* "We have never seen a bucket dig like our Williams does."
—*Central Contracting Co.*

Williams users report many benefits like the above experiences. They confirm the facts that Williams Buckets are unusually rugged and durable in service and fast in action. It shows too why your next bucket should be a Williams.

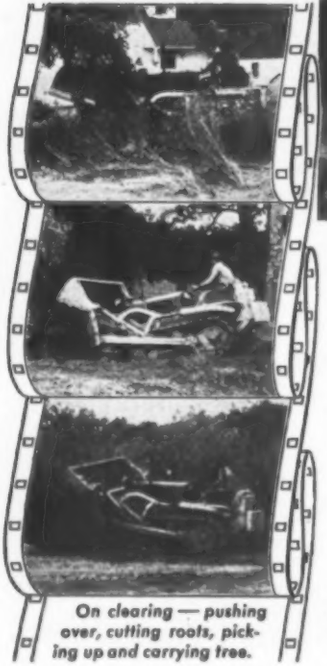
DISTRIBUTORS IN ALL PARTS OF THE COUNTRY

Each type of Williams Bucket is covered by individual bulletin. Write
THE WELLMAN ENGINEERING CO.
7003 Central Ave. • Cleveland, Ohio

WILLIAMS *Buckets*
built by WELLMAN

GRABS HOLD OF ANY JOB!

Drott Bull Clam Shovel



On clearing — pushing over, cutting roots, picking up and carrying tree.

On airport construction— loading, carrying and stockpiling material.

Countless Applications — Does the work of a shovel, scraper, bulldozer, grader, plus operations of most other units—excavates, fills, clears, levels... handles dirt, boulders, timber, debris, snow, ice ... practically anything its jaws can grab or its bowl can hold. Makes a smooth cut "on the go"... carries or floats load ... levels as it fills. Attachable to all makes of crawler tractors — a right size for all models. Wire, write or call for full information.

- Hydraulically controlled from operator's seat.
- Up to 3' lift above ground—one foot below.
- One to four yards heaped capacity ... three to twelve thousand pounds lift capacity.
- Raising and lowering of front clam controls cut. Either end tilted independently to 24" angle from operator's seat while tractor is in motion.

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EQUIPMENT

HI-WAY SERVICE CORPORATION
3841 W. WISCONSIN AVE., MILWAUKEE, WIS. • 739 MUNSEY BLDG., WASHINGTON, D. C.

HAZARD WIRE ROPES ARE *Uniform*

Yes, and IN UNIFORM

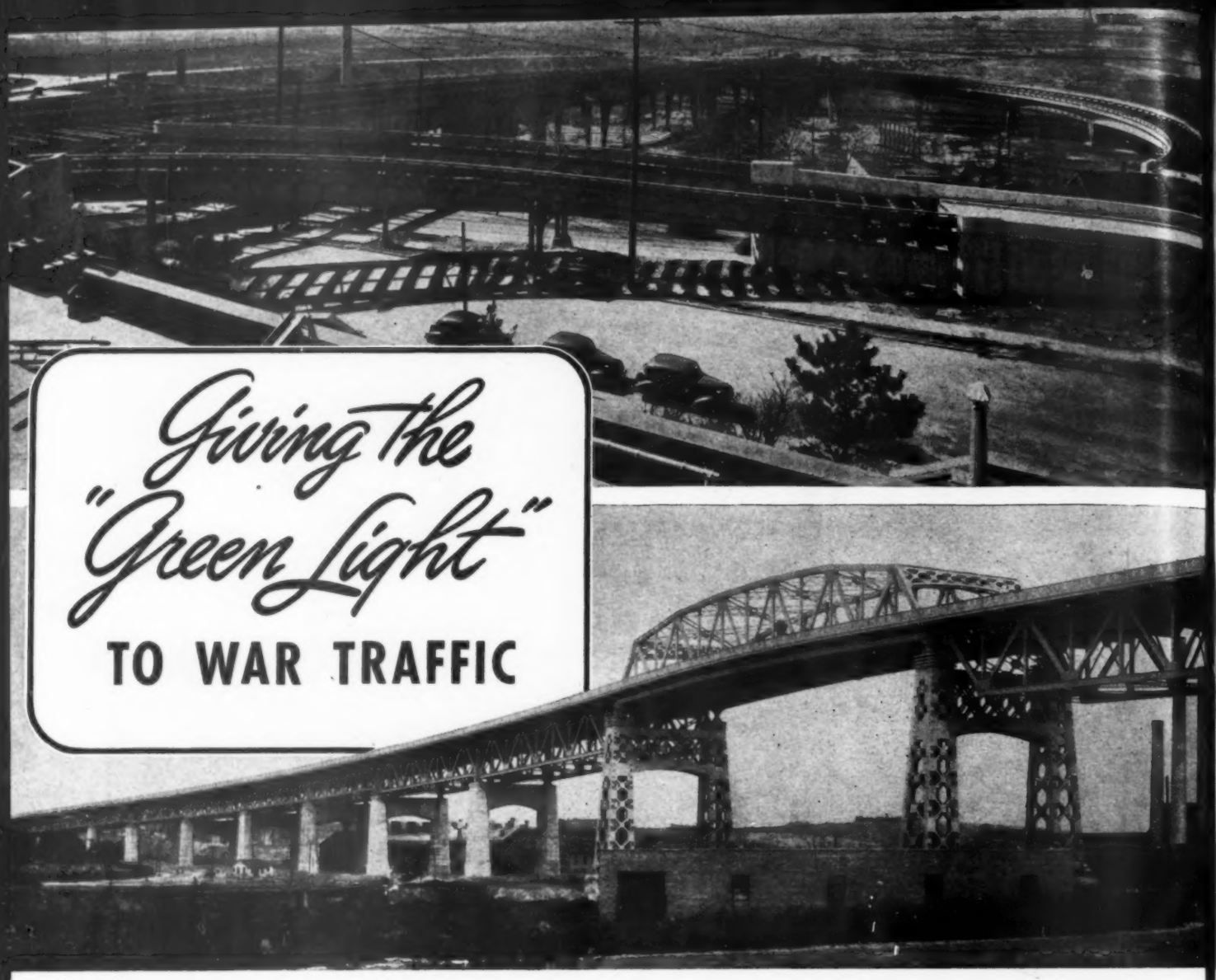
Since 1846, Hazard wire ropes have been famous for their uniformity—foot by foot, reel by reel. Uniform dependability is one of the big reasons why we have customers coming back for Hazard ropes, *continuously*, for 30, 40 and 50 years.

Today Hazard lines are not only uniform in quality but they are *in the uniform* of war work. They are being used for mine sweepers, torpedo nets, tethers for observation balloons, balloon barrage ropes, airplane controls, ship rigging, hoist ropes for lifting aerial bombs into place in bombers, winch ropes for Army motor trucks and tractors, ropes for airplanes and artillery, glider tows, parachute flares, parachute rip cords, firing controls on tanks and heavy gun mounts, shipyard crane ropes, etc., etc. Much of this rope is HAZARD LAY-SET Preformed Green Strand—the rope that lasts longer because it is free from internal stress. It is also easier and safer to handle, resists kinking, whipping or rotating in sheave grooves. Some of the rope is HAZARD "NONPAREIL"—the rope that represents 96 years of wire rope-making experience, known to "old timers" as well as the younger operators as the line that gets the job done efficiently and economically.

HAZARD WIRE ROPE DIVISION Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Fort Worth, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Tacoma

AMERICAN CHAIN & CABLE COMPANY, INC., BRIDGEPORT, CONNECTICUT

HAZARD LAY-SET *Preformed* WIRE ROPE



Giving the "Green Light" TO WAR TRAFFIC

WHEN production records fall, it's good news. But production alone can't win the kind of war we're fighting. It takes production *plus*—and one important "plus" is swift, efficient transportation. That's why America's modern integrated highway systems are top-notch war assets. They shorten the time between the manufacture of war material and action against the enemy. Numerous American Bridge-built structures are serving this useful function.

The intricate, 1152-foot long, dual roadway viaduct with its curved feeder ramps, pictured at the top, fills a double purpose in today's transportation emergency. It permits fullest utilization of railway and highway arteries which it overpasses, and streamlines the incessant traffic-flow it feeds into an under-river route to the vital seaboard.

The high-level viaduct and river crossing, also shown, is another important expediter of war traffic. It was planned primarily as a convenient express route between two industrial sections; but war has made it more than that. This viaduct is now an artery for fast-moving "priority" motor freight to docks and warehouses.

These two structures are typical of many exacting grade separations and traffic-routing projects built successfully by American Bridge Company, and planned with a foresight that stands the nation in good stead today.

Now—our entire resources are engaged in construction for war.

After Victory—these same resources of men and equipment will stand ready to serve with equal effectiveness the transportation needs of America at peace.

AMERICAN BRIDGE COMPANY

General Offices: **Frick Building, Pittsburgh, Pa.**

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit · Duluth
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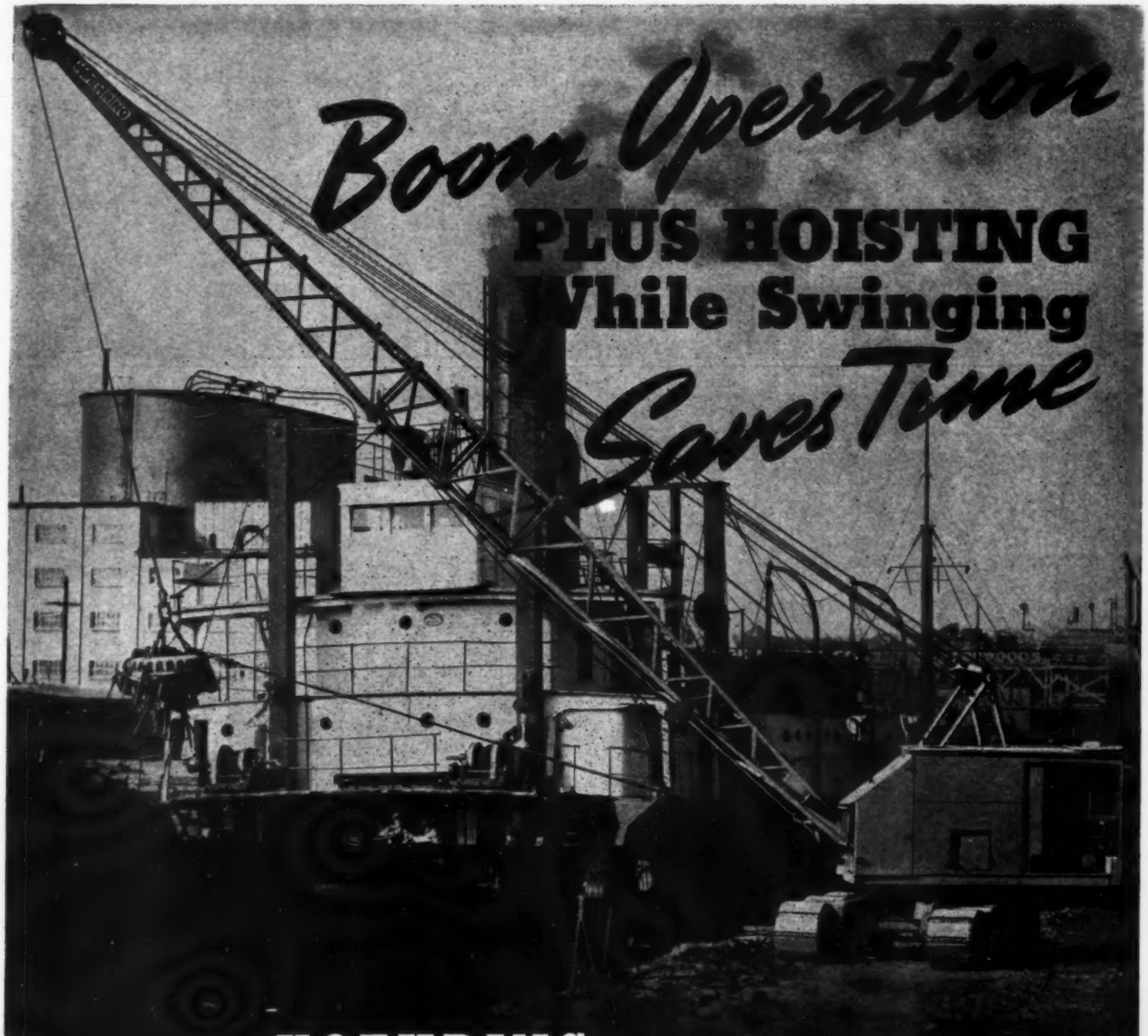
UNITED STATES STEEL



KOEHRING Crane Flexibility Is Important Time-Saver On This Job

Handling metal from stock pile to boat requires maneuverability. This, combined with the Koehring feature of raising or lowering the boom or hoisting while swinging or travelling, is reason why Koehring Cranes save time on this type of operation. Accurate magnet and grapple spotting and control is another important Koehring advantage. Steering in any direction in varying degrees of radii permits direct travel without "jockeying" around the yard. Time is an important factor in metal handling and Koehring Cranes are time-savers. Next time you need a crane talk to an owner or write us for complete information.

KOEHRING COMPANY · *MILWAUKEE, WISCONSIN*

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

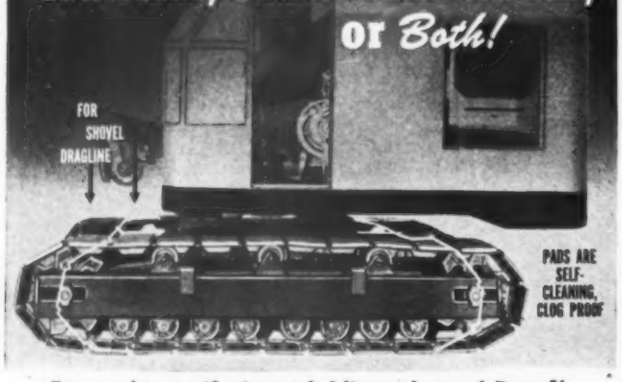
Convoys & Counterweights

CONVOYING ships act as buffers to protect vital cargoes from destruction by enemy forces. Owen counterweights divert material being handled away from sheaves and cables, assuring that the buckets will "come through" with capacity loads for the longest possible period of service.

THE OWEN BUCKET COMPANY
6070 BREAKWATER AVE. CLEVELAND, OHIO
Branches: New York, Chicago, Philadelphia, Berkeley, Cal.

OWEN BUCKETS
A MOUTHFUL AT EVERY BITE

for Soft Ground, for Stability,
specify BYERS extra long crawlers, extra wide treads, or *Both!*



For complete specifications and delivery of any of Byers ⅜-½- ⅝- ¾-yd. gas or diesel power shovels, cranes, draglines or hack hoes on crawler or truck mountings, see the nearest Byers sales and service headquarters, or wire factory.

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Specify **BYERS**
CRANES and SHOVELS
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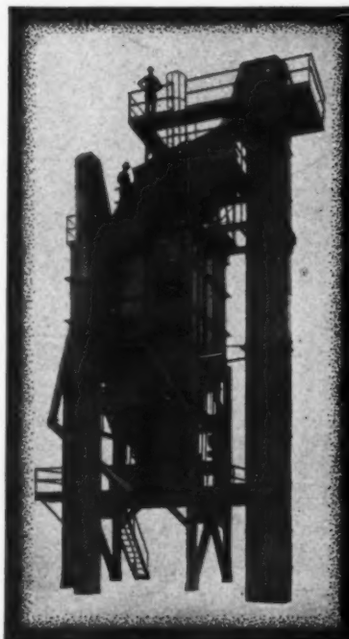
DISTRIBUTORS THROUGHOUT THE WORLD



Cut YOUR MIXING *Costs*

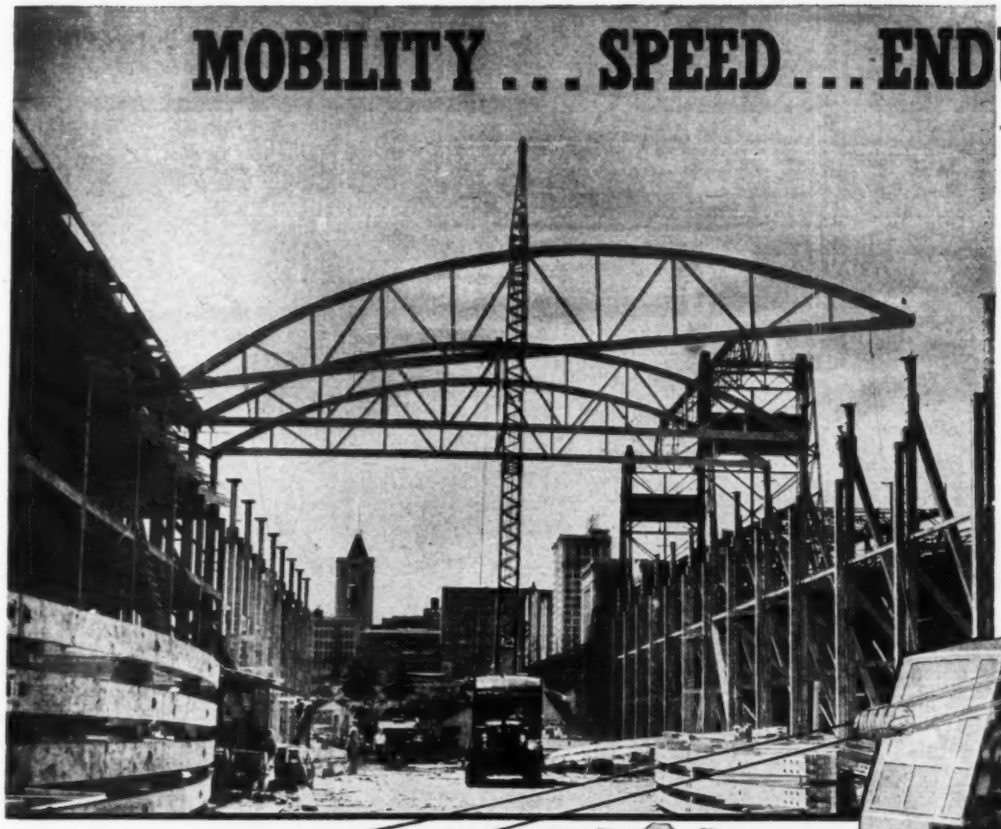
Modern bituminous mixing equipment is essential in meeting short time limits on many defense projects, but the production of this equipment is necessarily limited.
While this company's facilities are being used entirely in the war effort, a limited number of bituminous plants for defense purposes are available.
WE INVITE YOUR INQUIRIES.

H&B Hetherington & Berner Inc. 701-745 KENTUCKY AVENUE INDIANAPOLIS, INDIANA
ENGINEERS AND MANUFACTURERS

Tanks move doggedly forward wreaking havoc on the enemy but their speed is necessarily slower than trucks and their span of continuous service considerably more limited.
So they crawl up on Rogers Trailers and are moved quickly to the line of combat—or from it when repairs or reconditioning becomes necessary.
Thus, the effectiveness of an important combat unit is increased manifoldly by these non-combat vehicles.

ROGERS BROTHERS CORP., ALBION, PENNA.

MOBILITY . . . SPEED . . . ENDURANCE



Northwest Hauling Company's MICHIGAN Mobile CRANE, equipped with 75' boom, setting prefabricated wooden trusses in new plant of west coast ship yard. Trusses are 90' long and 15' deep.

MICHIGAN
Mobile CRANES

Shipyards throughout the country employ MICHIGAN Mobile CRANES in huge yard-expansion and shipbuilding programs. MICHIGAN mobility, speed and endurance contribute to fast erection of war-plants, power lines, pipe lines and countless other vital facilities.

These Air-Controlled MICHIGAN Mobile CRANES (3 to 12 ton capacities) may be important to the success of your *future peace time* program as well as to your present war-effort. Our engineering staff can offer valuable suggestions and cooperation in helping you solve your problems. Bulletin RS-122 contains complete information. Write for your copy today.

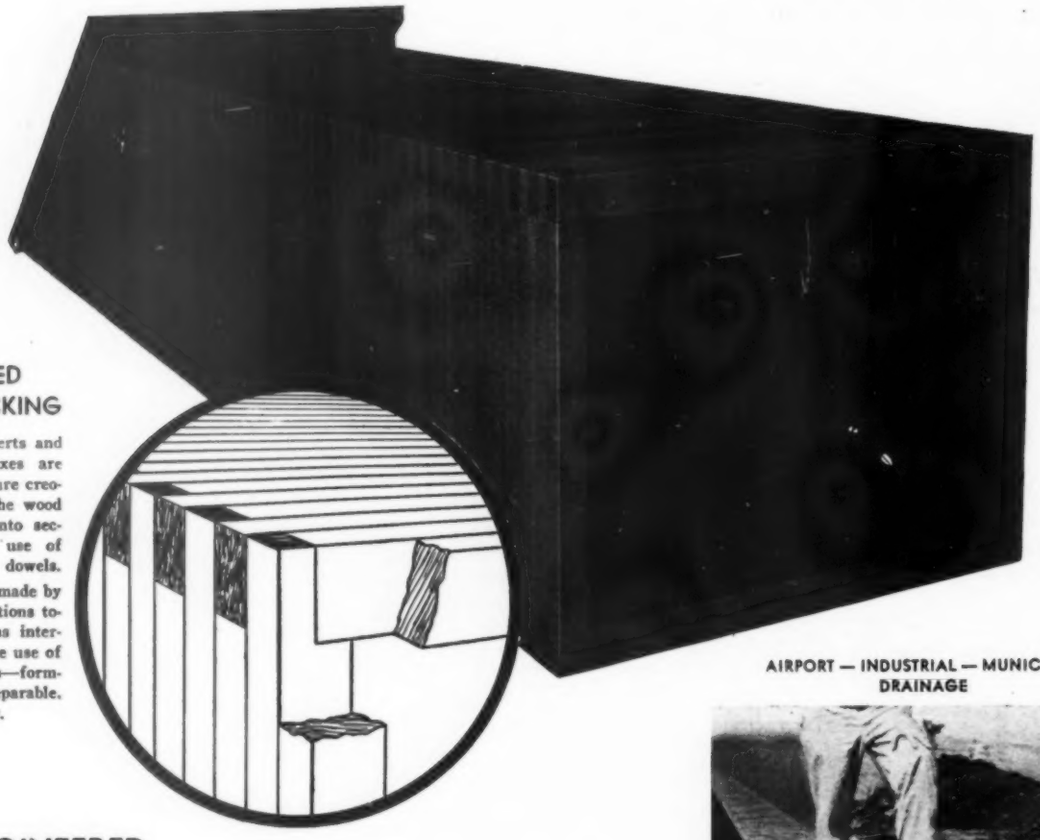
MICHIGAN POWER SHOVEL CO., Benton Harbor, Michigan, U. S. A.

MICHIGAN
AIR-CONTROLLED
SHOVELS - CRANES - CLAMS DRAGLINES - TRENCH HOES

LAMINEX DRAINAGE PRODUCTS

TRADE MARK

—better in war or peace!



LAMINATED INTERLOCKING

Laminex Culverts and drainage boxes are made of pressure creosoted wood. The wood is laminated into sections by the use of nails or wood dowels. Installation is made by joining the sections together. Sections interlock without the use of bands or nails—forming one inseparable, unified conduit.

AIRPORT — INDUSTRIAL — MUNICIPAL DRAINAGE

HIGHWAY CULVERTS

AN ENGINEERED *Permanent* DRAINAGE PRODUCT

— developed long before the war

Today engineers are fortunate in having a *PROVED* drainage product which does not interfere with the war program. Laminex Culverts and drainage products, made of pressure creosoted wood, were developed long before the war. Over 10,000 installations prove the value of this non-metallic product.

Remember, Laminex is a PERMANENT 50 year product—not a "temporary expedient" or a substitute . . . Laminex is an engineered product with definite computable strength . . . Whether in war or peace Laminex offers many advantages.

Approved by Federal and State Highway Departments

WRITE FOR SPECIFICATIONS

Ask for Bulletin No. 200-A which gives detailed specifications of sizes ranging from 1'x1' to 6'x6' and larger.

Wheeler Lumber Bridge & Supply Co.

Hubbell Bldg. Des Moines, Iowa

ROADS AND STREETS

December, 1942, Vol. 85, No. 12

Unreinforced Concrete Arches

An Indiana Example Demonstrates Advantages of This Type When Steel is Scarce

By CHARLES R. RUMINER

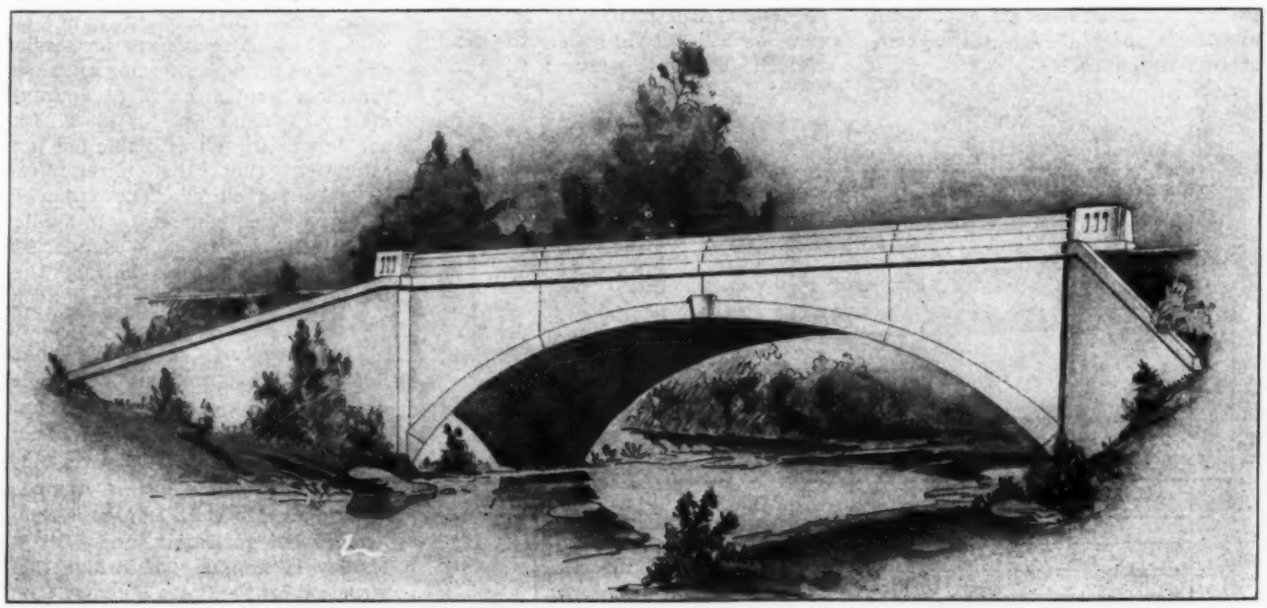
Supervising Engineer, Bridge Design Department, State Highway Commission of Indiana

IN OUR early civilization, structural steel and reinforced concrete were unknown. But this did not keep the ancients from using the materials at hand, and the masonry arch bridge was an early development.

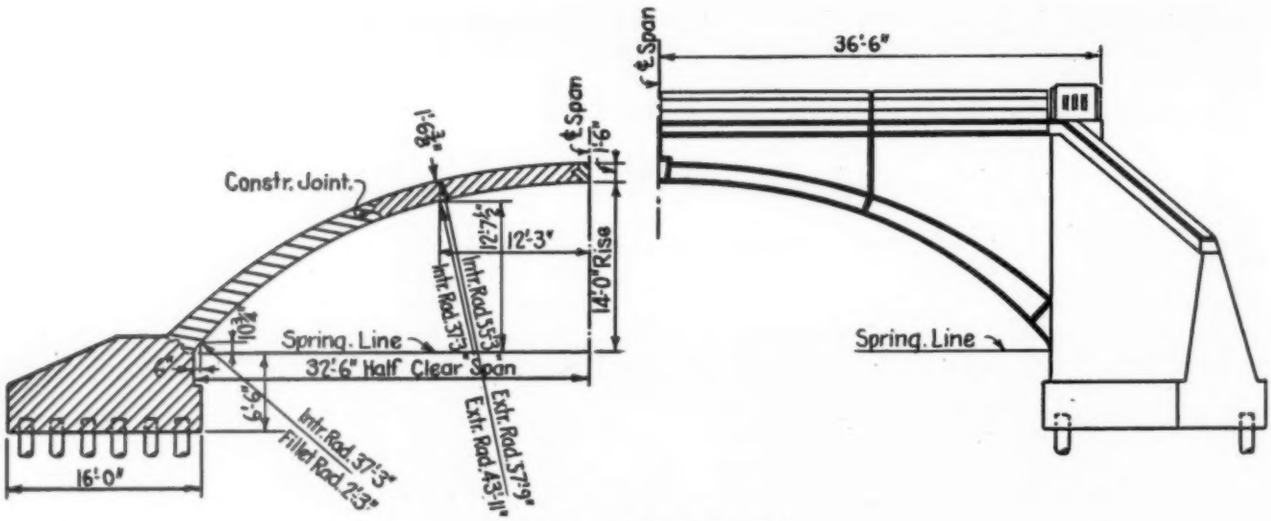
We come to modern times, and the arch bridge is still being built in great numbers. The State Highway Commission of Indiana in the past seven years has built 194 reinforced concrete arch bridges with spans greater than 20 ft. and a number of structures with spans less than 20 ft. During the life of the Highway Commission not a single failure has occurred due to design or construction in this type of structure. The only failure that has occurred was of one structure that was undermined during the unusual flood conditions of 1937.

A national emergency has now arisen which limits our use of structural and reinforcing steel. Some bridge construction is considered necessary for public safety and more is necessary for access roads to army camps and munition plants. While some steel is available it is desired to eliminate as much as possible. This can be done through the use of gravity type concrete abutments and piers with timber superstructures of comparatively short span, or with plain concrete arches. Since we have a plentiful supply of cement and aggregate, plain concrete arch bridges seem to be the answer to our problem.

The Arch Division, Bridge Department of the State Highway Commission, prepared plans and now has under construction an unreinforced concrete arch bridge with a span of 65 ft., rise of 14 ft., and a clear roadway of 28 ft. This structure is designed with gravity type spandrel



Perspective of plain concrete arch on Indiana State Road No. 75, north of Frankfort



Half section and elevation of arch

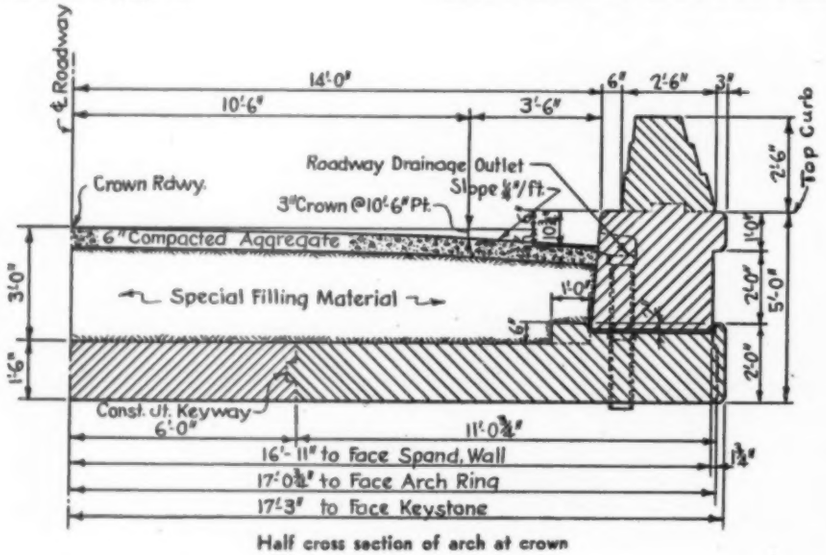
walls, handrails, abutments, and wing walls.

The arch ring is shaped and analyzed the same as it would be if it were reinforced, except that temperature stresses are not considered. Using the three-hinged arch principle, the ring is shaped under dead load so that the load line is exactly on the ring centerline. The ring is then analyzed by the elastic theory as a fixed end arch, using the critical live loads for maximum stresses. As we consider the concrete to have no strength in tension, especially as construction joints are placed at the skewbacks and at approximately 20-ft. centers around the ring, the load line by the elastic analysis must always be in the middle third. If the load line falls outside the ⅓ point, the ring must be thickened and reshaped. By the use of construction joints and a keystone at the crown, the shrinkage stresses are eliminated and the temperature stresses are considered negligible.

A minimum height of fill over the crown of the arch was set at 3 ft. This height, while somewhat difficult to obtain without excessive fill on the approaches, is necessary to spread equivalent pressure equal to 50 lb.

Spandrel walls, wing walls and abutments are designed as gravity type, with the base and any section to be 100 percent effective with a horizontal fluid equivalent of earth pressure equal to 30 pounds per square foot. These same sections were checked for a construction condition of 75 percent effective with fluid equivalent pressure equal to 50 pounds.

Our handrail presented quite a problem. Of course a block of concrete could be set up that would satisfy the safety requirements, but what about the appearance? A concrete handrail 2 ft. 6 in. wide and 2 ft. 6 in. high does not lend itself to artistic treatment. Our final design, we believe, will satisfy the most critical. The base width 2 ft. 6 in., the top width 1 ft. 3 in., with sides battered and stepped in (see sketch) presents a streamlined appearance and at the same time fulfills the requirements of the A. A. S. H. O. specifications.

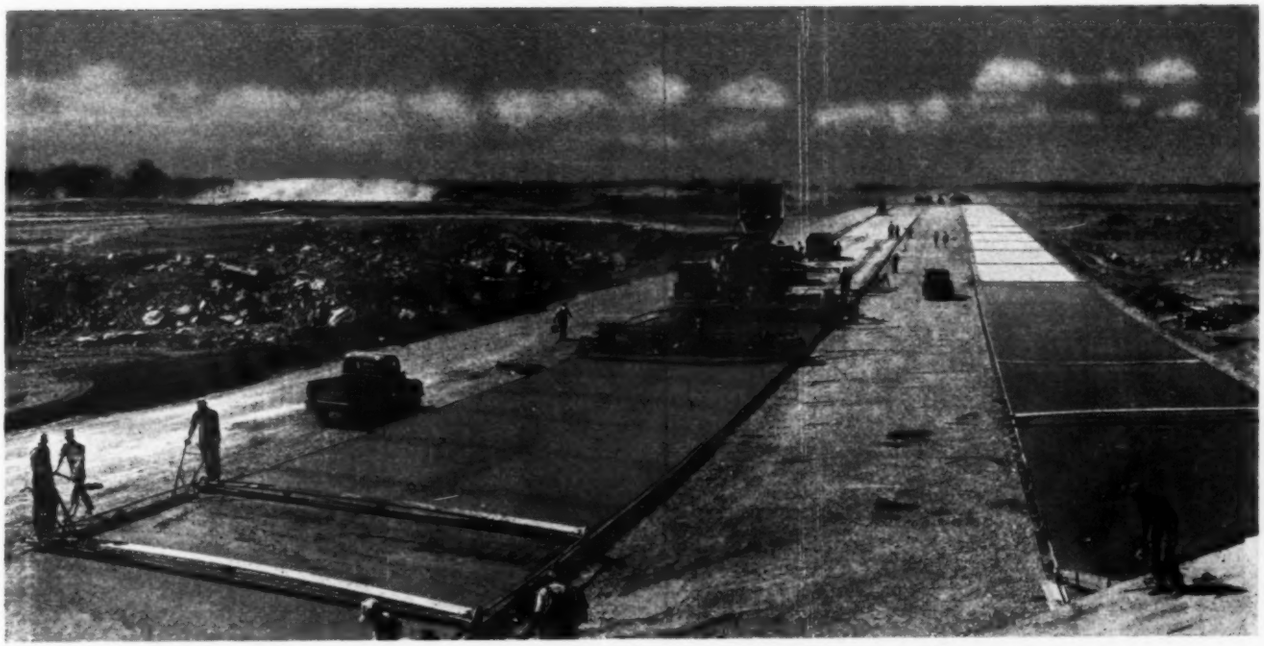


Half cross section of arch at crown

As no reinforcing steel has been used on this structure, the yardage of concrete has been considerably increased over the amount required for a reinforced concrete structure. The quantity of concrete figured is 1132.5 cu. yds. The contract price of the project, including grading and surfacing approximately 325 ft. of approaches is $31,341.10. This gives a unit price per cu. yd. of concrete of $27.67. However, to make a fair comparison with reinforced structures, let us consider just the items that are a part of the structure proper; such as all concrete in structure, wet and dry excavation, piling and reinforcing steel. Using the bid prices for these items, the unit price per cu. yd. is $24.60. The average for similar structures using reinforcing on which contracts were awarded at approximately the same time, is $33.97. Exact figures are not available but it is estimated that the unreinforced structure requires approximately twice as much concrete as a similar reinforced structure. A comparison of the above unit costs indicates that the unit cost of the concrete is about 28% less.

This structure located on State Road No. 75 approximately 12 miles north of Frankfort, was let on June 9, 1942 to Deniston & Garber, Rochester, Indiana. Ray H. Bower is Chief Engineer, Fred Kellam is Engineer of Bridges, Albert D. Dunlap is Engineer of Bridge Design, and Witt W. Hadley is Engineer of Bridge Construction for the State Highway Commission of Indiana.

15,000 Sq. Yd. Concrete Daily At Southern Airport



Stone spread across entire 150-ft. runway width helped keep pavers going even in weather too wet for earth moving

AT a large mid-southern airfield maximum speed and continuity of concrete paving operations were insured through the wet spring months by good paver management and by capitalizing the stone base as a working mat. Three 5,500-ft. runways with connecting taxiways, aprons, and ramps to 5 hangars were placed and the entire job, including 3,000,000 cu. yd. of material removal in grading, was practically completed between February 9 and June 1.

Excavation, planned in such a way as to permit fast follow-up on the pavers, was rushed in 3 shifts using scrapers or shovels and trucks and depending on the haul. Intermittent rainy periods were offset by showings of as high as 350,000 cu. yd. in good weeks.

Notes on Paving Procedure

Six pavers handled the job. Two outfits, consisting of a 34-E dual-drum working alone and two 34-E single-drums teamed up on each side of the forms paved main runways from one batching plant. Two other outfits, comprising a pair of 27-E pavers also in main runways and a 27-E "clean-up" mixer for ramps, taxiways, etc., were served by another plant. The five runway pavers operated two 8-hour shifts; the clean-up unit, one. With a 10% overload this outfit averaged approximately 15,000 sq. yd. or slightly over a mile of 25-ft. runway strip per paving day.

The value of crushed stone as a working mat as well as a pavement base was demonstrated by the fact that through 60 spring days pavers worked every day—even on rainy days when grading was halted by muddy conditions. The procedure was to place crushed limestone in two courses. First a 3-in. layer was spread over the entire 150-ft. runway width. Then when forms were set a second layer was placed, graduated up to 3 in. additional thickness to conform to the subgrade cross-section for the 10-7-10 slab. Stone was crusher-run, well graded up to 1½ in. max., the top course having about 5% binder dust.

The project was under the supervision of a district office of the U. S. Corps of Engineers.

The finished runway looks like this

A 1000-Mile Wartime Highway In Australia

By AXEL OLSEN
Melbourne Argus War Correspondent

ONE of the most dramatic stories in Australia today is being written on the all-weather road that runs through the center of the Northern Territory from Alice Springs to Larrimah. The road was opened in September, 1940. Today it is believed to carry the largest single transport organization in the world. Week after week there is an unending cavalcade of hundreds of huge Army trucks rumbling northward with enormous quantities of equipment, material, and food for northern battle stations.

A section of the graveled road

Quantities carried and distances travelled are so vast that it is difficult to bring them into perspective, and even after travelling over the road watching line after line of convoy trucks roll northward it seems almost incredible that such an organization could have been built in less than 2 years. Army convoys today are covering double the mileage of all the oil companies in Australia in peace time. Total mileage for a leading oil company was 9 millions a year. The convoys on the north-south road now do 3 millions a month. Total mileage from September, 1940, to May, 1942, was 15½ millions.

Very soon the road will be completed for 1,000 miles from Alice Springs to Darwin, an amazing highway passing through some of the most remarkable country in Australia, and linking the northern defense areas with the south.

In the early days of Japanese attacks on Australia it was a disquieting thought that the only land link with supply and reinforcement bases was a vulnerable railroad which might be put out of action for a time with one bomb. The new road removes that fear, for even the heaviest bombing could not put the road out of action for long. The new portion of the road from Larrimah to Darwin is an extremely valuable addition to lines of communication with northern battle stations. After the war its value as a tourist attraction will be enormous.

621 Miles of Road Built in 87 Days

The 621 miles of roadway from Alice Springs to Larrimah have stood up remarkably well to constant wear of heavy Army traffic, and, although corrugated in places, the road is being regraded, and will eventually be covered with bitumen. Some strips have already been bitumenised. Initial cost of the road was $1,573,000, and large sums are being spent on constant maintenance.

The Alice Springs to Larrimah road was built in the record time of 87 days. Twelve hours after the Army unit in charge of the convoys arrived in Alice Springs the first convoy set out for Larrimah. By the end of the first month of operation the trucks had covered 261,000 miles at a cost of 9.15 cents a ton-mile.

Early in 1941 there was a decline in distances covered; but in March, 1941, when there was a speeding-up of defense work, totals began to reach new heights. In November, 1941, the convoys travelled 595,000 miles at a cost of 7.72 cents a ton-mile. December's total was 921,000, and in January, 1942, the million mark was passed. In March, the mileage was nearing 2 millions. In June the total mileage was nearing 3 millions, and costs had been reduced to 4.48 cents a ton-mile. Costs are lower than for normal civilian operation, and, although wages and cost of vehicles and supplies are, of course, lower for the Army, depreciation is higher because of climatic conditions. Petrol consumption for each vehicle shows a good average.

The brigadier in charge, former transport manager for a leading oil

Grading in rough country with scraper carrying 12 tons of earth

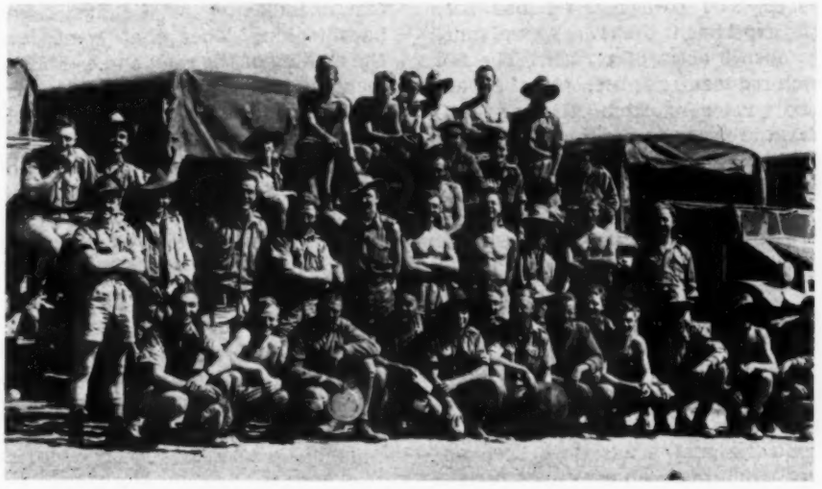
Supplies are dropped along the road for transport to outlying camps. Camel teams operated by Aboriginals are used for these subsidiary transport lines

company, who was responsible for development of the organization, and has watched it grow from the day the first convoy left Alice Springs, is justifiably proud of the work his men are doing. They live a hard life, spending a great deal of their time on the road, sleeping in the trucks, eating at staging camps, and enjoying few of the amenities of more settled jobs.

Today there is not the same shortage of trucks or personnel, staging camps along the road have better equipped workshops, and there have been improvements in every direction. The men, however, still have an arduous job. They carry on in all weathers—intense heat of summer, torrential rains, and the bitter cold of winter nights. The drivers attend to all loading and unloading, and when they return from a trip spend the following day servicing their trucks. The next day they train in the morning, and, although they have the afternoon off, are not allowed out of camp, for the town is out of bounds, and there are few other places to go. The following day they begin loading their trucks again, and early next morning they are beginning another 600-mile trip.

Considering the lack of entertainment and barrenness of their lives, the convoy drivers are remarkably content. They have, of course, many minor grievances; but the only major grievance they seem to have is lack of leave in their home State.

It is a big problem, bound up largely with transport difficulties, as it is not practicable to send large numbers of troops on trains that are badly needed to carry supplies. Army authorities are trying to overcome the difficulty, and a plan for granting leave to soldiers who have served 12 months or more is in operation. First groups of convoy drivers are now on leave.



Some of the men who built the road

Staging Camps

Splendid work in maintaining vehicles and providing meals for convoy personnel is being done at the staging camps which have been established between Alice Springs and Larrimah. They are almost self-contained, carrying large stocks of rations to cater for any number of troops, and able to deal with practically any mechanical defect that occurs to trucks. Each camp has a workshop, and handles up to 200 trucks a week, doing a surprisingly wide range of repairs.

At one staging camp, set amid hundreds of miles of a lonely wilderness, a small community has been developed that is almost independent of the outside world. Water is obtained from a bore sunk originally to water stock. There is a field bakery producing excellent bread and supplying two other staging camps. The feature of the camp, however, is the garden. In a dry, dusty plain a small plot of ground has been fenced off, and, with water from showers, a flourishing vegetable garden has sprung up. Tomatoes, turnips, cucumbers, melons,

Strengthening weak sections with gravel and bituminous material

A rest and refueling station

and beans are growing at an amazing speed, and so successful has been the experiment that it is now planned to open 3 acres of garden. The soil, rich red loam, has been ploughed, and six gardeners from another army farm are soon to begin growing vegetables. It is also planned to keep pigs and fowls at all staging camps.

Every day some improvement in organization and equipment is made, and the efficiency of the present system is indicative of the months of backbreaking labor that went into the making of the road and establishment of the convoys.

The road has been of incredible value in strengthening Australia's defenses. After the war it will be of untold value in the exploitation and settlement of the Northern Territory.

Standards for Traffic Signal Control Heads

Standards governing purchase specifications for adjustable face traffic control signal heads have been approved and published as an American Standard by the American Standards Association. They cover such specifications as housing, doors, gasketing, traffic signal lenses, reflectors, lamp receptacles, wiring, visors, trunnions and brackets, exterior finish and method of mounting, with a supplement governing arrow lens and walk lens. The new standards were developed under the leadership of the Institute of Traffic Engineers. These standards are available from the American Standards Association, 29 West 39th St., New York. The price is 25 cts. per copy.

Gift Truck Replaces the One Japs Took

When the Japanese took Wake Island, they captured an eight-ton truck made by the Four Wheel Drive Auto Co. of Clintonville, Wis.

Today employees of the company gave the Marine Corps a new truck of the same type. Working on their own time with material furnished by the management, the workmen contributed the truck which will be sent to the Solomons.

Migratory Workers to Get Supplementary Gas Rations

Migratory workers, including farm laborers who move with the harvest from one section of the country to another, need have no fear of being stranded away from home by the advent of national gasoline rationing.

Under present gasoline rationing in the East, and under plans being prepared for the entire nation to conserve the country's auto tires, workers engaged on farms and war construction projects rank as essential workers in the war effort. They therefore are entitled to supplementary gasoline rations to move about as their work requires.

Those now away from home who decide to stay in the areas where they are now working, will be entitled to gasoline rations necessary to enable them to carry on their work, and to get back to their home towns when their work has been completed.

Urban Street Traffic and Rural Truck Highway Travel in Minnesota

Average traffic on all municipal roads in Minnesota is slightly higher than on the average rural trunk highway, according to data compiled by the Highway Planning Survey, joint project of the Minnesota Department of Highways and the Federal Public Roads Administration. Average traffic within the two largest cities is more than twice as heavy as on the average rural trunk highway, while average traffic in all municipalities of less than 25,000 averages considerably less than on rural trunk highways.

Annual average daily traffic on rural trunk highways was 529 vehicles, while the average for all municipal roads was 535. In municipal roads are included extensions of state trunk highways and county roads, local streets, parkways, and all other public thoroughfares within city and village limits. The average for each population group was found to be as follows:

Population Group	Miles of Roads	Annual Average Daily Traffic
Places 1,000 or less	3,492	165
Places 1,001 to 2,500	1,512	228
Places 2,501 to 5,000	1,341	284
Places 5,001 to 10,000	809	409
Places 10,001 to 25,000	1,104	440
Duluth	622	666
Minneapolis-St. Paul	2,345	1,481
All municipal roads	11,225	535

While the traffic averaged 529 per day for all rural trunk highways, the average for the original or constiutional routes was 740 per day and for the new or legislative routes only 232 per day. Traffic on state aid roads was found to average 100 per day, on county aid roads 43 per day and on township roads 13 per day. In other words, traffic on the original trunk highways was more than three times as heavy as on the new routes; the average for all trunk highways was more than five times as great as on the average state aid road, more than twelve times as heavy as on the average county aid road, and more than forty times as heavy as on the average township road.

Figures for trunk highways and other rural roads are based on traffic counts over a 12-month period. Figures for municipal thoroughfares are based on estimates of total traffic within municipal areas, computed from interviews with nearly 20,000 motor vehicle owners, representing all vocations and all sections of the state, regarding where and how many miles they drive in a year.

Dating The Ice Age Varves

By HALBERT P. GILLETTE

IN 1937 I published evidence of a series of weather and climatic cycles, each of which is three times as long as the next shorter one. This may be called a triple-progression series. The amplitudes of these cycles are greater than those of any other cycles of comparable length, and the amplitude increases with the length of the cycle. By means of varves (annually deposited layers of sediment) I have determined the length of the 67-year cycle of this series with great precision. It is exactly 67 years long between its peaks of rainfall, and is therefore harmonic with the earth's orbital period of 12 months. The following are the lengths in years of some of the cycles of this triple-progression series: 67/81, 67/27, 67/9, 67/3, 67, 201, 603, 1809, 5427, 16,281 and 48,843 years. The last named cycle is the Ice Age Cycle. The last "peak" (maximum snowfall and minimum temperature) of this cycle was in 27,864 B.C.

It may seem fantastic to give the date of this peak with such precision, but since peak dates of short cycles of this series are determinable with precision, it follows that, because these cycles are harmonic, peak dates of the longest cycles are determinable with precision once their dates are determined approximately.

The 5427-year cycle had its last wet, cold peak about 700 B.C. But since the last 201-year cycle had its peak in 1883, it follows that the cycle of 27 × 201 or 5427 years must have had its peak in 729 B.C. Having established this peak date, it follows that, by a similar process, the exact peak year of the Ice Age Cycle of 9 × 5427 or 48,843 years is determinable with exactitude if the approximate date of its last dry, warm maximum is determinable at all. There is abundant evidence of a long and exceedingly dry, warm phase about 3400 B.C. This was certainly not due to the 5427-year cycle alone, for its next dry, warm peak will be in 1984; and while there is much evidence of growing warmth and dryness, it is not comparable in severity to that about 5427 years earlier. The cycle of 3 × 5427 or 16,281 years must therefore have been partly responsible for the dry, warm phase about 3400 B.C.; but the question remains whether the cycle of 3 × 16,281 or 48,843 years was not mainly responsible for that dry, warm epoch. If it was, then the wet, cold peak of that cycle (the Ice Age Cycle) was in the year 27,864 B.C.

Dr. Ernst Antevs has written two books and two long monographs, in which he graphed the thickness of several long series of Ice Age varves of New England and Canada. By measuring, tabulating and analyzing these thicknesses I was able to find several short cycles of my triple-progression series in all of these Antevs' varves.

I had found that all the large planets cause rainfall cycle peaks when they are in heliocentric longitude 288 degrees. The earth is in that longitude July 12, and it then causes a great sunspot peak, and, in many regions, a rainfall peak. Daily sunspot numbers and daily rainfall records must be used not only to establish this peak date July 12, but to show how great is the amplitude of these 12-month cycles. The average number of daily sunspots for 50 years is 53 on July 12 and only 34 on January 9, the peak being about 50 per cent greater than the valley.

In passing, let me say that I infer the existence of a stream of galactic electrons flowing sunward, the center of the stream being in heliocentric longitude 288 degrees.

The giant plant Jupiter has an orbital period of 11.86223 years; and the next smaller planet, Saturn, has an orbital period of 29.45772 years. The latter, significantly, causes a rainfall cycle of greater amplitude than the former. Even remote Uranus, whose orbital period is 84.0153 years, causes a noteworthy rainfall cycle, whose last peak date was 1909.23.

In styding the 84-year cycle curve as shown by varves, I noticed secondary peaks 21 years before and after the main peak. From this I infer that there are secondary streams of galactic electrons flowing sunward about in heliocentric longitudes 288—90 or 198 degrees, and (288 + 90)—360 or 17 degrees. The earth is in 198 degrees on April 9, and in 18 degrees on October 13. There are two great meteor showers whose peaks occur April 20, and October 20. I infer that they are due to streams of galactic electrons flowing sunward, carrying meteoric matter; and that when a planet crosses these streams its magnetic field tends to "focus" more of the electrons toward the sun, whence their subsequent escape affects our weather.

Electrons, it should be remembered, tend to reflect heat and light, whence it follows that increase in their number in the air over a given region must lower the temperature there, and thus tend to cause rain or snow. An Ice Age therefore is the result of a very great increase in electron numbers in the atmosphere over certain regions.

There are cycles 3,9 and 27 times as long as the Ice Age cycle of 48,843 years. The one 27 times that length is the Geological Period.

Marine terraces caused by the 16,241 year cycle are spaced about 75 ft. apart in southern California, and their number, 23, indicates that that coast has been rising for about 370,000 years, or since the beginning of the Quaternary Age. Terraces cut on our Atlantic coast show that it has risen only two-fifths as much as our Pacific coast. By applying cycle data it follows that the Quaternary Age began 376,766 B.C.

I was able to date the Antevs' varves of the Ice Age, and thus to confirm the peak dates above given, by finding many cycles in each of his long series of varves. The longest unbroken series starts with a varve numbered 2700 and ends with one numbered 6277, covering nearly 3600 years. Antevs calls this his Hartford Series. I found that his varve 4400 was laid down 24,246 B.C., and marks the second cold, wet peak of the 1809-year cycle following the Ice Age peak. His varve 6209 marks the third peak of the 1809-year cycle after the Ice Age peak, and is therefore a peak of the 5427-year cycle. Antevs found varves resting on the underlying glacial till in only two places in this Hartford Series, namely bottom varve 4450 near Amherst, Mass., and bottom varve 6000 at Claremont, N. H., about 56 miles north of the bottom varve at Amherst. Hence the ice-front retreated a mile in about 28 years in this region. Near Claremont there is a recessional moraine, and about 4 miles north of Claremont there is the head of a 50-mile long train of boulders. A similar train exists about 60 miles to the east, in another valley. I infer that near the wet peak of the 5427-year cycle, the morainal dams across these two valleys were washed out by excessive floods due to the spring melting of very heavy

falls of snow. There is another long boulder train whose head is 15 miles north of Providence, R. I. Here another morainal dam evidently burst about the first peak of the 1809-year cycle after the Ice Age peak. The head of this boulder train is about 50 miles north of the terminal moraine; and therefore the average rate of retreat of the ice there was about 36 years to the mile, inclusive of "halts" while the terminal and the recessional moraines were being deposited.

Antevs measured a series of 700 varves near New Haven, Conn. By means of cycles I found the date of varve No. 20 to be 26,658 B.C., or 1206 years after the Ice Age peak. The second peak of the 603-year cycle after the Ice Age peak occurred when the ice-front was near New Haven, or about 30 miles from the terminal moraine.

Antevs measured a series of 952 varves near Hackensack, N. J., in a brickyard about 14 miles from the terminal moraine on Long Island. By means of cycles I found that varve No. 9 of this series was deposited 27,261 B.C. or 603 years after the Ice Age peak. Hence the rate of retreat of the ice front in the first 603 years after the Ice Age peak was about 43 years per mile. Antevs' Hackensack varve No. 1 rests on the underlying till where its northern end was at the ice-front. All these varves were deposited in glacial lakes, held by a morainal dam at the lower end and by the ice-front at the upper end.

Maps of recessional moraines in the Dakotas, Minnesota and Canada show horizontal spacings that indicate the 201, the 603 and the 1809-year cycles. Taylor's series of 14 recessional moraines in the Berkshires of western Massachusetts mark peaks of the 67-year cycle. The spacing of heads of "outwashes of sand" often mark floods due to the 22⅓-year cycle.

De Geer's varve in 1173 of the Vallby Series in central Sweden was deposited in 17,144 B.C., 134 years prior to a peak of the 5427-year cycle. That peak was 17,010 B.C., which is recorded by the major one of the Fenno-Scandian moraines. Its correlative is the broad morainal dam at the south end of the Canadian lake Timiskaming. The moraine at Cochrane, Canada, about 150 miles to the north, marks a peak of the 1809-year cycle. The rate of retreat of the ice-front during those 1809-years was about 12 years to the mile, or nearly four times as fast as during the first 603 years after the peak of the Ice Age.

It has usually been inferred that Ice Age varves were thicker during warm phases of cycles, on the theory that the ice would then be melting faster, causing greater conveyance of silt. But an extensive ice-sheet delivers more water from the melting of the last winter's snow than from melting of the glacial ice. Hence the varves are usually thicker near wet peaks of cycles. Varves are thicker near the ice-front than far from it. Like shingles, they "feather out" as well as overlap. I find that, when allowance is made for this "feathering out," varves are thicker near wet peaks of the 201, the 603 and the 1809-year cycles.

Varves deposited in glacial lakes usually vary much more in thickness than those deposited in seas. The latter are found consolidated into rock, and in any given region and period are usually quite uniform in thickness. I infer that marine varves are mainly the product of wave action, and that the same is true of most sedimentary rocks other than limestone.

The last rain peak of the 201-year cycle and all its subcycles was July 12, 1883. One of its subcycles is 7.444 years long, and its next rain peak will be February 1, 1943. This cycle "combines" with the Venus orbital period to cause a cycle that is only 1.4 days longer than 8 months. Its next rain peak will be December 20, 1942.

In a later article, evidence will be given showing that each of the cycles of the triple-progession series is caused by the rotation of an electron-shell that encases the sun. The length of each cycle of this series is the period of rotation of an electron-shell, and its wet, cold peak occurs when the south magnetic pole of the electron-shell is in heliocentric longitude 288 degrees. The longitudinal conjunction of such a magnetic pole and a planet is accompanied by a wet, cold peak. The mean length of such a conjunction cycle is found by multiplying the length of a given triple-progession cycle by the orbital period of a given planet, and dividing the product by the difference between those two periods.

There are numerous short conjunction cycles of this sort, but I have found no evidence that the conjunction of any two plants causes a noteworthy increase either in sunspots or in rainfall.

There is, I believe, only one remaining problem of much difficulty relating to the use of cycles in forecasting weather. I refer to the causes of opposed phases of the same cycle in different regions. A clue to this cause is the southward shifting of storm tracks near peaks of the 22⅓, the 67 and the 201-year cycles. The process is analogous to the shifting of sunspots to lower latitudes as a peak of the 11⅛-year cycle draws near. Incidentally that sunspot cycle is just half the length of the 22⅓-year rain cycle, which indicates that magnetic polarity of electrons due to their spiral motion is an important cause of difference between sunspot and weather cycles.

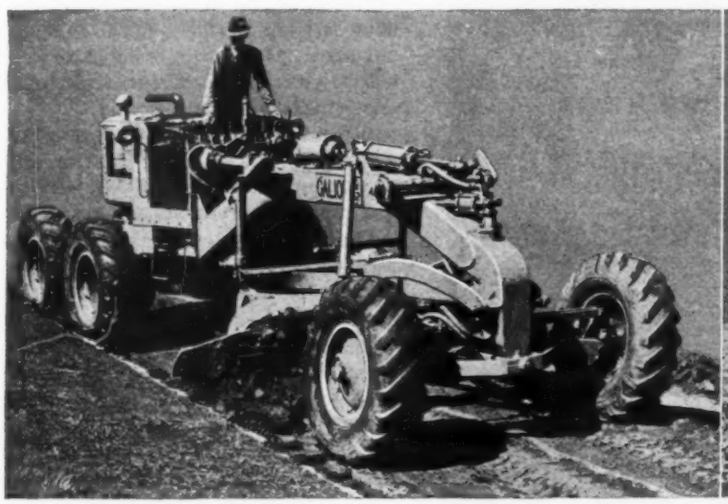
Cycles in Ice Age varves rarely show phase inversions, whereas the same cycles in tree-rings often show phase inversions; notably so in the California "big trees" or sequoias, and less often in the pines of northern Arizona. For this reason, as well as because the main Ice Age varve series measured by Antevs total more than 10,000 varves, I have come to rely upon those varves in cycle research with great assurance as to the deduced cycle lengths. For determining very long climatic cycles, rock strata are the most reliable, provided that enough varves are measured to determine the time required to deposit the sediments that built a foot of rock in the given locality. Alternate beds of shale and limestone record the cold and the warm phases of a cycle, whose length is usually determinable with considerable accuracy even if relatively few varves are measured. Each one of a sequence of beds of the same kind of rock (e.g., sandstone) if of comparatively uniform thickness, usually records a cycle of the triple-progression series whose length is determinable if the rock contains even a few varves. This fact seems not to have been recognized by geologists or meteorologists. It serves to confirm inferences from other facts that the cycles of greatest amplitude are those of the triple-progression series. Hence for forecasting purposes, cycles of this series are of greatest value.

At first it seems very strange that great as well as small movements of the earth's crust record cycles whose lengths are the same as those of weather and climatic cycles. But the puzzle is solved by electron theory. Electrons in motion are magnets. Hence when great numbers of solar or galactic electrons bombard the earth, they induce magnetism in all the paramagnetic matter in the earth's crust and core. This results in a downward movement of the crust in regions where the induced magnetism is greatest, this vertical movement being greatest at peaks of the strongest cycles. As the weak phase of an electron cycle approaches, the crust in those regions rises again. Hence every cycle tends, in a given

V

WAR CONSTRUCTION JOBS LOOK TO GALION . . .

Galion road machinery is fully occupied in the war effort—our entire output going to the armed forces or to civilian contractors on vital war work. Fast-moving motor graders and road rollers signed up for the duration, speeding construction in airports and cantonments, making the going easier on access roads, around dams and in housing projects. When the final peace is written we hope again to serve you . . . until then, keep your present Galion machines in running order.



THE GALION IRON WORKS & MFG. CO.

region, to cause a downward movement of the crust during one half of the cycle, and an upward movement during the other half. Thus the Geological Period, which is a cycle about 1,320,000 years long, produced maximum depression of the crust in certain regions about 370,000 years ago, since which time the crust has been rising. But at electronic peaks of certain shorter but strong cycles, such as the 16,281-year cycle, there is a reduction in the rate of crustal uplift, which lasts long enough for sea waves to cut a wide terrace. As above stated, that cycle has cut 23 such terraces, inclusive of the one at the beginning of the Quaternary Age. Intermediate terraces of less width are to be seen at times, caused by the 5427-year cycle; and more rarely, in sheltered places, terraces due to the 1809-year cycle are to be seen.

Very great depressions of the crust have been accompanied by folding and faulting in certain regions, thus building mountains near peaks of the long cycle called Geological Periods, and more strikingly near peaks of the much longer (3 times as long) cycle that may be called a Geological Era, and the one 3 times as long as that which may be called a Geological Age.

Even as short a cycle as the one 201 years long causes noteworthy depressions of the earth's crust in certain regions, e.g., in France in 1884, when after many years of slow subsidence the sea reached a maximum elevation all along the French coast. Archeologists report a much greater subsidence of that coast about 700 B.C. As above stated, the 5427-year cycle had a peak 729 B.C. At about the same time French "Lake Dwellers" were driven from their homes built on piles, because the lake levels rose. About 300 years later, many of those lakes went dry; which is clearly due to the dry phase of the 603-year cycle.

In a forthcoming book on Cycles, data supporting the statements and theories in this and previous articles will be given, besides a large amount of information not previously published. Each of many kinds of cycles will have a chapter devoted to it. At the end of the book there will be numerous tables of thicknesses of varves, tree-rings and other data used in determining the lengths and dates of cycles.

Civil Engineers Needed Urgently by Navy

The Navy Department has an immediate need in Construction Battalions (Sea Bees) for officers experienced in field construction work of all kinds—from roads to dams and barracks. Successful applicants will be appointed in grades of Warrant Officer, Ensign, Lieutenant (jg), Lieutenant, and with a few in the grade of Lieutenant Commander.

The main qualifications, which cannot be emphasized too strongly, are the individual's ability to head up a crew of men and build a road, barracks or warehouse anywhere in the world; plus the ingenuity to build it out of whatever material is available, and with whatever equipment is at hand; and an essentially rugged physical condition that "can take it." These qualifications will transcend all other considerations, and for the right man waivers will be granted for non-organic physical defects, age, and lack of a technical degree, which is desirable but not necessary. Six years' field experience will be considered in lieu of a technical degree.

Generally speaking, men under 30 do not possess the required field experience, and should have a degree; the same is true in a lesser extent for men between the ages of 30 and 35; but above 35, the professional record will be given more consideration than the educational background.

In general, men with the following experience will be considered for appointment as indicated, subject to the usual requirements for grade.

Field construction foremen, Warrant Officer.

Field construction section chief, Ensign or Lieutenant (jg).

Field construction superintendent, plus construction administrative experience, Lieutenant.

Field construction superintendent on large projects, plus considerable construction administrative experience, Lieutenant Commander.

Age limits are 21 to 50. Waivers may be granted on the upper age limit, providing the applicant is in good physical condition and possesses all other necessary qualifications.

If applicants are able to meet other qualifications, every consideration will be given to physical waivers.

For further information all interested qualified men should contact the Advisory Committee, Naval Officer Procurement, 121 W. Adams St., Chicago. Tel. Andover 4412.

FLASH!! From Alcan Highway! Shown here on arrival at Whitehorse, Yukon Territory, the night of November 22, is the first party to negotiate the last-completed link of the Alaskan Highway from Fairbanks in a civilian passenger vehicle. Taken by ROADS AND STREETS' Associate Editor, Harold J. McKeever, this photo shows (left to right) Floyd K. Brown of the Lytle & Green Construction Company, Sioux City, Iowa; C. G. Polk with the Public Roads Administration; C. Coykendall of Lytle & Green; and E. C. Henningsen of Western Engineering Company, Harlan, Iowa

EXPLOSIVES

A Chapter from the Truck Trail Handbook of United States Department of Agriculture—Forest Service

The average consumption of dynamite in the United States in normal times is about 1,000,000 pounds per day, and of commercial black powder about 200,000 pounds. For the current year the figures will be somewhat higher. This increase is due entirely to quarrying, mining, and construction operations, for neither dynamite nor black powder is used in combat.

Large scale blasting operations are commonly carried out under the direction of experts, thoroughly versed in the technics of the art; but thousands of other jobs—some of considerable size—are handled by men of less training and experience. To all such engaged in grading, excavating, clearing, minor quarrying operations, and the like, Chapter VIII of the Truck Trail Handbook of U. S. Forest Service will prove of great value. It is up to date, containing, as it does, the latest matter on this subject prepared for publication by the Forest Service Division of Engineering. Few constructors not directly concerned with work in the National Forests are familiar with it.

Through the courtesy of the Service, *Roads and Streets* presents the entire chapter to its readers—the firts part herewith, and the remainder in our next succeeding issues.

The Editor

TRUCK TRAIL HANDBOOK
CHAPTER VIII—EXPLOSIVES

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CHAPTER VIII—EXPLOSIVES

800. General Description

Commercial explosives are solids or liquids that can be instantaneously converted by friction, heat, shock, sparks, or other means into large volumes of gas. This conversion is essentially similar to, but much quicker than, converting water into steam. This greatly increased volume exerts both a blow and a pressure on the confining material. It is this action that is effective in blasting.

The pressure acts equally in all directions, but the gas tends to escape through the path of least resistance. All explosives in this respect act in exactly the same manner and, therefore no matter what explosive is used, loading and tamping must be done very carefully in order to force the gas to do the desired work upon the material to be blasted. See 805. Loading.

Explosives for Forest Service work include all of the dynamite types—nitrostarch, ammonia, nitroglycerin, and gelatin. All of these are detonating explosives; that is, they are fired by shock from an intermediate agent called a detonator or blasting cap.

801. Characteristics of Explosives

Some of the principal characteristics are strength, velocity or shattering effect, water resistance, sensitivity, temperature of freezing, ignitibility, and fire-setting ability. Explosive engineers call fire-setting ability "Incendivity."

A. Strength

By this term is meant the power or force developed by the explosive. The straight, or nitroglycerin, dyna-

(Continued on page 40)

THIS BRUTE SAVES ITS BREATH...

This two-fisted, rugged rock drill stays on the job longer — with no air-wasting "back-talk."

Worthington's Blue Brute Rock Drill (WJ-55) saves *your* breath, too, for you don't waste hell and damnation on a tool that is easy on the operator and rarely interrupts the work for maintenance and repairs.

All Worthington Blue Brutes are like that. Rock drills and air tools, designed for a complete range of jobs . . . from hardest rock to clay or fitchery earth . . . *use less air*, cause less trouble, save time and money in the long run. Portable and semi-portable compressors . . . gasoline-driven, diesel, electric . . . equipped with Worthington's time-tested "Feather-Valves" . . . *deliver more air*, more smoothly, more economically.

Get a demonstration, *now, on your present job*, of how Blue Brutes will help you get more WORTH from air!

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Ask your nearest Worthington distributor, listed on page 39, for the free EQUIPMENT SAVER which shows you how to conserve scarce metals, lowering maintenance costs for all Blue Brute users from coast to coast. If your distributor is not listed, let us send you this free cost-cutting aid to efficient production direct from Holyoke.

On the Job with

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A Worthington Blue Brute WJ-55 Rock Drill, on trial at a western quarry, made such a hit with the operators that they tried to keep it by *hiding* it when the trial was over! Said the Super, after buying: "It out-drills all our competitive makes by 2 or 3 inches per minute."

On hundreds of army, navy, air-force and ordnance projects all over the country, Blue Brutes are at work.

Get more WORTH from air with WORTHINGTON

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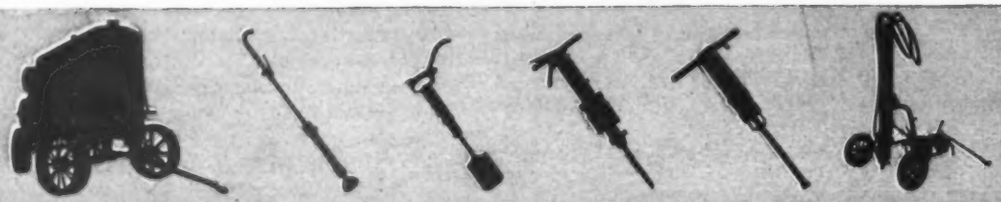

Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

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Houston — McCall Tractor & Equipment Co.
San Antonio — Patten Machinery Company
VIRGINIA
Richmond — Highway Machinery & Supply Co.
WASHINGTON
Seattle — Star Machinery Company
WEST VIRGINIA
Fairmont — Interstate Engineers & Constructors
WISCONSIN
Eau Claire — Bradford Machinery Company
Green Bay — Nelson Machinery Company
Madison — Western Equipment Company
WYOMING
Cheyenne — Wilson Equipment & Supply Co.

Get more WORTH from air with WORTHINGTON

Buy Blue Brutes

Worthington Pump and Machinery Corp.

Heavy Maintenance Companies Being Organized for U. S. Army

The American Road Builders' Association is co-operating with the U. S. Army Ordnance Department in the sponsorship of heavy maintenance companies throughout the country. Objective is to meet the army's urgent need for mechanics and technicians qualified to keep its fighting tools in combat condition.

First of these companies, the 527th heavy maintenance tank company, was organized in North Carolina, followed by formation of a depot company in the same state. ARBA-sponsored companies in Georgia, Virginia, Alabama, Ohio, Pennsylvania, Michigan and Massachusetts. Co-operating with the association in the recruiting programs were the highway departments and ARBA affiliates in the various states. Officers and personnel for a Missouri Ordnance Company will be selected in December, under the direction of C. W. Brown, state highway department chief engineer and official nominee for American Road Builders Association president. Arrangements are now being made for the sponsorship of numerous other state companies in the year ahead.

The highway organization was recently cited in a speech by Major General L. H. Campbell, chief of ordnance, U.S.A., for its aid in "taking the trained mechanics of the automotive industry and bringing them into the Ordnance Department in the soldiers uniform so that they can do for our weapons what they have done for our private cars."

Mechanics, machinists and repairmen are particularly needed for these heavy maintenance units. Personnel also includes electricians, carpenters, storekeepers, motor and Diesel experts, company clerks, stock clerks, dispatchers, shop order clerks, toolroom clerks, automotive electricians, blacksmiths, automobile body repairmen, cooks, tool makers, toolroom keepers, heavy truck and tractor drivers, warehouse foremen, electric welders, tractor mechanics, chauffeurs, engine specialists and carburetor specialists. All physically fit men between the ages of 18 and 45 with civilian training or experience along these lines are eligible for enrollment.

Upon enlistment, members of these companies are placed in the enlisted reserve and called to active military service at a date specified by the War Department. They are given an intensive course of military training, followed by intensive training in the type of material with which they will later work. Upon its completion, they will be assigned to service with the combat troops and may go to any part of the world where American troops are stationed. It will be their job to issue the equipment, make the inspections and do most of the repair work for the combat units they serve.

Tanks, guns, fire-control instruments and automotive equipment assigned to field armies and combat tank troops will be their responsibility. With mechanization winning battles, the repair and maintenance of combat weapons and vehicles is today one of the most important jobs of modern warfare. Ordnance units deal with guns, from the infantryman's rifle to the largest coastal defense weapon; ammunition, from pistol cartridges and hand grenades to 4,000-pound bombs and huge armor-piercing projectiles effective at 30 miles; combat vehicles such as scout cars and tanks, and optical instruments which insure the accuracy of artillery and anti-aircraft fire. Men of the ARBA-sponsored companies will thus have an opportunity to do important work with which they are familiar under officers and with men who speak their own language both geographically and professionally.

Standard Specifications for Concrete Manholes

The American Standards Association, 29 West 39th St., New York, has approved standard specifications for concrete masonry units for construction of catch basins and manholes. They cover solid, re-cast, segmental concrete masonry units made from portland cement and suitable aggregates and intended for use in the construction of catch basins and manholes.

These specifications, which were developed by the American Society for Testing Materials, apply to such aspects as: physical requirements, dimensions and permissible variations, visual inspection, marking, sampling and testing, rejection and expense of tests.

(Continued from page 37)

mites are rated on the percentage by weight of nitroglycerin which they contain. Thus in a 40 percent straight dynamite, the weight of nitroglycerin is 40 percent of the total weight. The strengths developed by the various percent grades of nitroglycerin dynamite serve as a basis for the grading of all other dynamites. Thus the percent strength grading of any other kind of dynamite means that it will release as much force as an equivalent grade of the nitroglycerin dynamite, weight for weight.

The actual energy developed by the different percent strengths is *not* in direct proportion to the percent; i. e., 30 per cent is 1.16 times as strong as 20 percent, 40 percent is 1.3 times as strong as 20 percent, and 60 percent is only 1.5 times as strong as 20 percent.

B. Velocity

The rate of exploding or detonating is spoken of as velocity or quickness. Some explosives detonate more quickly than others and their shattering effect is accordingly greater. For this reason the lower percent grades are used for stump blasting and loose rock formations and the higher percent grades for hard rock, springing, and mudcapping.

C. Water Resistance

Explosives differ greatly in their power to resist water. In dry work this is of no importance, but when much water is encountered, a water-resistant explosive is necessary. If the blasts are fired soon after loading, the use of an explosive intermediate as to water resistance is found satisfactory. Thus ammonia dynamite can be used satisfactorily where water stands in the holes, if the blast is fired immediately after the holes are loaded. Nitrostarch powder can be used under water if the charge will be fired the same shift. If the explosive is to be left under water for any length of time, a gelatin or semi-gelatin dynamite must be used.

D. Sensitiveness

Sensitiveness is the property which causes an explosive to detonate when subjected to shock. The test for sensitiveness is made by placing the two halves of a 1-¼-by 8-inch stick in a roll or tube of paper. The two halves are separated a few inches so that the roll will be 1-¼ inches in diameter but will be longer than 8 inches. The lining paper in dynamite cases or its equivalent should be used. One-half of the cartridge is detonated with a No. 6 cap. The spacing between the two halves is varied to determine the maximum distance at which the primed half will explode the other half. This gap in inches is known as the sensitiveness of the powder tested. In general, high-velocity explosives are more sensitive than low-velocity explosives. Where a high fire hazard exists, explosives low in velocity and in sensitiveness are not desirable.

E. Temperature of Freezing

Practically all commercial explosives are now low freezing; and will not freeze under ordinary exposure to such atmospheric temperatures as occur in this country. However, this handbook contains in Rule 15, article 810 D, instructions for use during cold weather, which must be observed. See also 810 C, Thawing Frozen Explosive.

F. Ignitibility Index

Ignitibility index is the term used to indicate the property of explosives which causes them to ignite or burn when exposed to heat. Standard tests of ignitibility are conducted by the Bureau of Mines. See 802 C, Relation between Ignitibility Index and Fire Hazard.

G. Incendivity (Fire-Setting Ability)

An explosive having the least flash or fire-setting ability is adapted to Forest Service use during extreme dry periods when the humidity is low. However, the chance of setting a fire even with slow (low velocity) powder is materially reduced by using a tight tamping with noncombustible stemming.

802. Selection of Explosives

A. Acceptable List

The explosives used on Forest Service work are indicated in table 800, Types of Explosives on Forest Service Acceptable List.

This list of explosives has been prepared by the Bureau of Mines for Forest Service use. The explosives enumerated are well adapted to our work. As other explosives are tested and found suitable, or the explosive manufacturers develop new explosives, or as existing brands are changed or their manufacture discontinued, the lists will be changed. Explosives used for Forest Service work are to be confined to this list.

B. The Importance of Velocity

In selecting an explosive, the most important consideration is wheather the material to be blasted requires a quick shattering force or a slow propulsive force. Rarely are more than two types of explosives needed on a project. A careful reconnaissance of the work to be done will give a fairly accurate estimate of the quantities of the fast disruptive and slow propulsive explosives needed for economical blasting.

A quick disruptive explosive is one having a high velocity, approximately 15,000 to 24,000 feet per second. It is adapted for use in solid masses of rock, in ice, and for stumps in very light loose soils where a root-cutting effect is desired.

The slower propulsive explosives are those having a velocity from 3,500 to 10,000 feet per second. They are used for stumping and soft rock work. The slower explosives of this series are used for soil erosion work, blasting gullies, etc.

The importance of selecting the explosive best adapted to any given condition is far greater than is generally realized. A quick disruptive explosive will, when used for stump blasting, cut the roots, and cause extra work or additional blasting to remove them. A slower propulsive explosive will pull or heave and generally draw most of the roots out with the stump.

Table 800 shows the velocity of explosives on the Acceptable List.

C. Relation Between Ignitibility Index and Fire Hazard

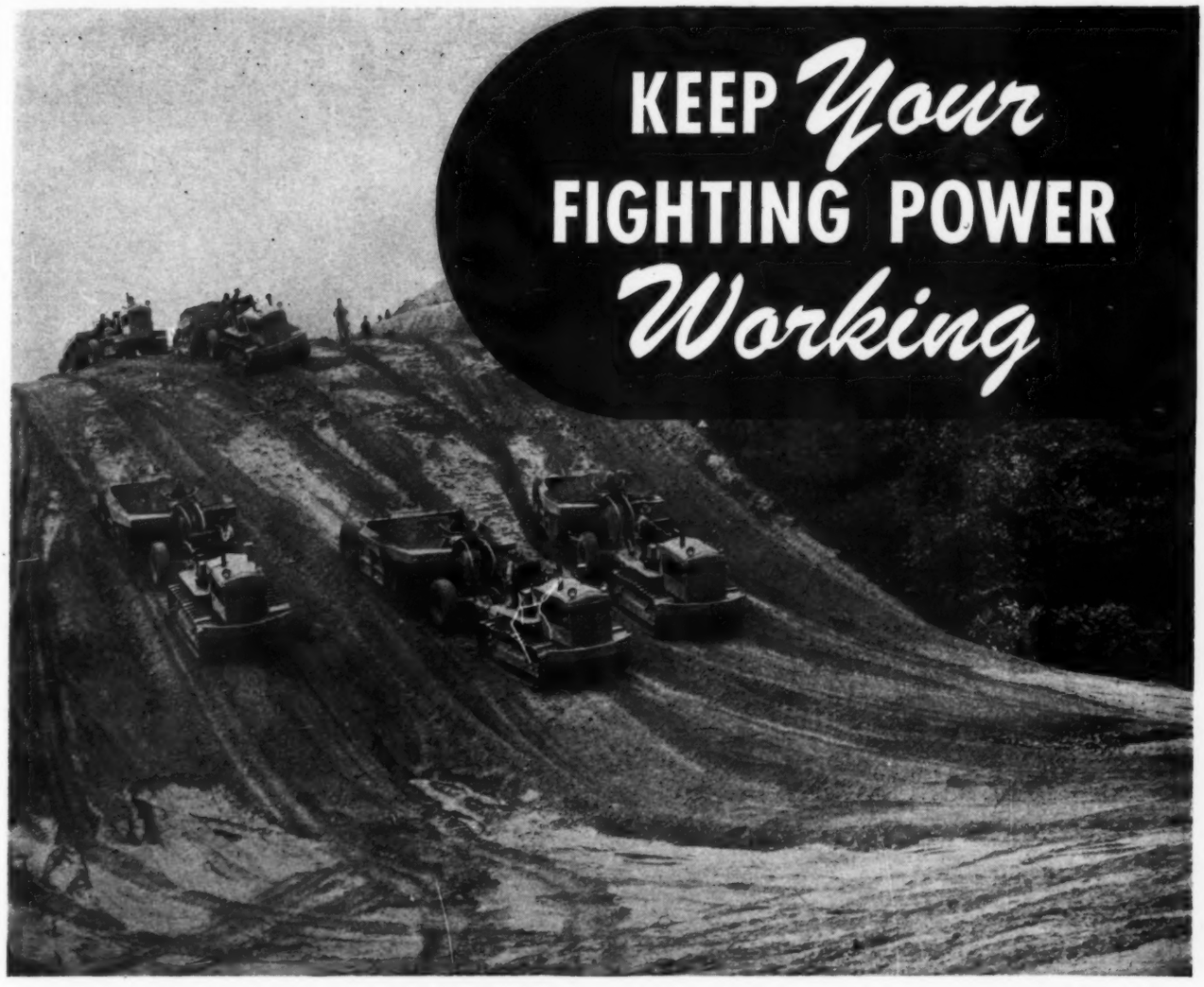
Explosives with an ignitibility index greater than 250 should not be used where a fire hazard exists. The only explosive on the Forest Service Acceptable List with an ignitibility index greater than 250 is type A, class 1, grade 50 percent. Since the use of this explosive is permissible only in water or extremely wet conditions, no fire hazard would exist.

D. Free-Flowing Explosives Packed Loose in Bags

During the dry season, a free-flowing explosive is the handiest to use for loading certain types of material. It is not generally recommended because of the inclination toward overloading or waste. However, in experienced hands free-flowing explosives have advantages for such as:

1. Seam loading
2. Sprung hole loading
3. Vertical drilled holes
4. Coyote or gopher holes
5. Ragged down holes where cartridged explosives have a tendency to catch or block the hole.

During the wet season free-flowing explosives are not recommended as they are susceptible to dampness and, when fired in wet holes, may not explode or may give only a partial detonation. Free-flowing explosive comes in 12½-pound bags packed in



★ This is a war of *power*—man-power and equipment-power—on the home lines as well as on the battle lines.

So your Cletracs are *essential* power—*fighting* power—wherever you are using them because Cletrac power is dependable power, controllable power, and economical power.

NO PRIORITIES ON **WAR BONDS**

Next to the Stars and Stripes, Cletrac is proud to be flying the Minute Man flag. Over 95 per cent of Cletrac employees are purchasing War Bonds by pay roll deduction.

Your present obligation to the war effort is to keep your Cletracs and other equipment running in top-notch condition to deliver the greatest possible use. Your Cletrac dealer will help you get the most out of all of your equipment. Ask him for his advice and suggestions. Even though your Cletracs have delivered many thousands of hours of service, they may need a small amount of mechanical work or a few replacement parts that will usually put them back in "fighting trim."

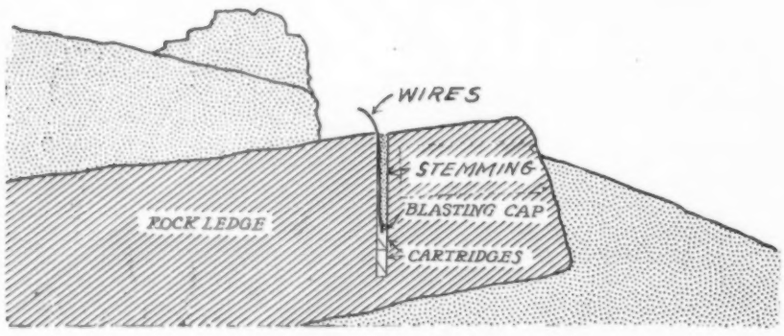
THE CLEVELAND TRACTOR COMPANY
CLEVELAND, OHIO

Cletrac Crawler Tractors

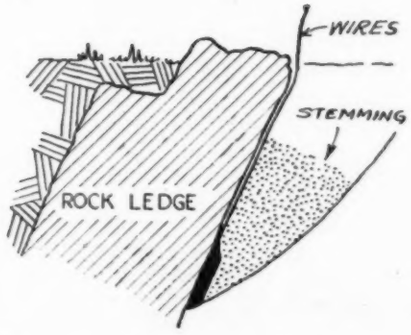
GASOLINE AND DIESEL

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

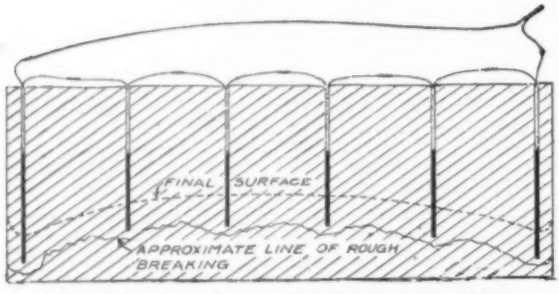
EXPLOSIVES *(Continued)*



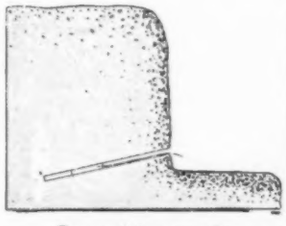
Blockhole method for ledge blasting



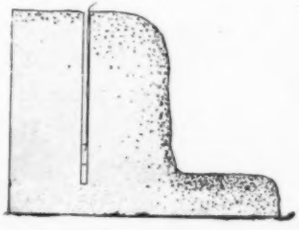
Snakehole method for ledge blasting



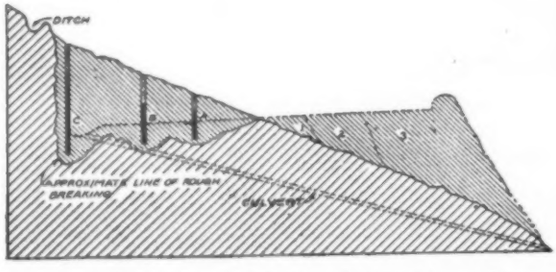
Elevation of approximate loading for cut work on highways. To give the proper crown and sufficient depth for the side ditches, drill deeper the holes away from the center.



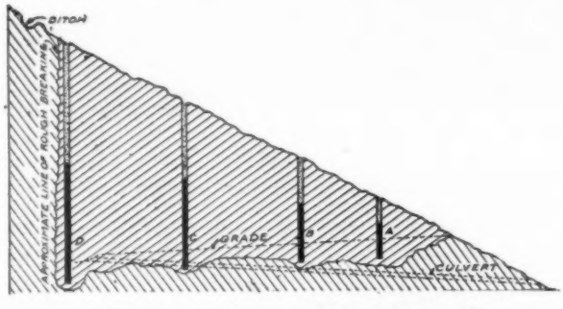
Location of a flat or horizontal bore hole in a road cut.



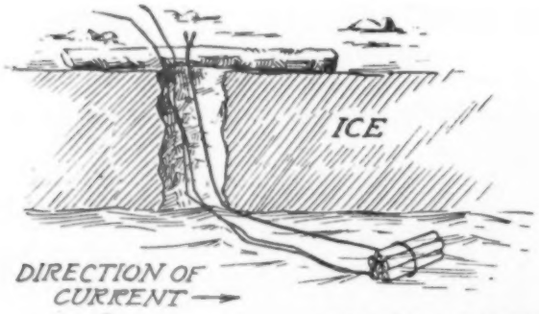
Location of a deep vertical bore hole in a road cut.



Approximate method of loading for hillside cut and fill. In earth or clay the side of the cut should be sloping to prevent caving. Another short hole in the top of the bank will aid in making this slope.



Approximate method of loading for hillside cut where excavated material is to be wasted or hauled elsewhere. In earth the side of the cut should be left sloping instead of vertical to prevent caving.



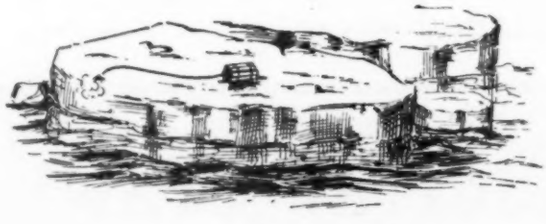


FIG. 800.—BLASTING SOLID ROCK AND ICE

(Continued on page 44)

14-Ton Welcoming Committee

From the Arctic to the Tropics, wherever our fighting forces disembark, they are generally greeted by the sight of a sturdy Baker Bulldozer that is busy making things ready for them.

Mounted on massive, powerful tractors, they are a welcome sight to Johnny Doughboy who saw Bakers doing the groundwork at camps and airports at home with speed and precision. But they're not a welcome sight to enemy bombers who know that our air bases won't stay bombed, with Bakers ready, willing and able to move right in after an attack to fill craters and remove debris. In fact, they've got those Jackaxis—Hitler, Hirohito and Mussolini—not a little worried. Thought they had us bottled up.

Well, they've got another guess coming. They'll find Bakers with their direct hydraulic blade lift and full down pressure can build camps and mold air bases—clearing brush and trees, leveling and grading — faster by far than forced hand labor can do it! Bakers are doing their part to win a rapid victory —send for a copy of "The Unsung Heroes of War."

Baker "V" type and One-Way Truck and Tractor Snow Plows will keep war production plants accessible this winter and army camps and airports free of snow.
Baker Road and Airport Building Equipment has enlisted for the duration, too.

THE BAKER MFG. CO.
506 Stanford Ave., Springfield, Illinois

BAKER

The Modern Tractor Equipment Line for
EARTH MOVING
LEVELING AND GRADE BUILDING
SNOW REMOVAL
ROAD MAINTENANCE

(Continued from page 42)

wooden cases and in all percentages of strength.

803. Blasting

Particular attention is called to 402 Ab,* Care in Blasting.

A. Trial Shots

It is good practice, when a large volume of material is to be moved, to make several trial shots and observe accurately the amount of explosive used and the yardage broken by the shot. For the first trial, only enough holes should be drilled or dug and fired to make a fair test of what this spacing and loading will do in the given material. From this evidence, either the spacing or the loading or both should be modified to conform to the results of the trial.

See tables 801, 802, 803 and 804. Also figures 800, 801, 802 and 803.

B. Blasting Rock

a. Amount of explosives required. Because of the different types of rock to be blasted and the conditions encountered, it is impracticable to give a set rule for quantities of explosives necessary to remove a given quantity of burden. Ordinarily, the charge will vary from ¾ to 1½ pounds of dynamite for each cubic yard of rock to be moved, the amount depending on the toughness, cleavage, and fracturing characteristics of the rock and the grade of explosive used.

Table 801 shows spacing of drill holes and amounts of explosives for the first trial shots in unfamiliar materials where hard shooting is permissible. Also see 803 A, Trial Shots.

b. Springing. In very tough hard material, the holes should always be sprung so as to form a cavity or chamber of sufficient size to accommodate most of the charge at the bottom of the drill hole. The same is true of deep holes in the softer rocks, except when the danger of losing the hole by springing is too great. To form the required size cavity in hard rock may require the firing in each hole of several successive charges. The springing charge should start with ½ or 1 stick, increasing by 2 to 5 sticks for each successive springing shot. The size of the cavity is judged by an experienced man watching the amount of dust blown out or by feeling with a tamping stick. See 805 B, Care in Loading. A fast high-strength explosive should be used for springing. Always allow the hole to cool after springing. Cooling may be hastened by blowing the hole with compressed air.

c. Seam shooting. By taking advantage of seams or crevices in all outcropping rock formations, it is possible to cut down the drilling, and in some cases to eliminate it entirely. A free-flowing explosive (grades A

(Continued on page 63)

TABLE 800
TYPES OF EXPLOSIVES ON FOREST SERVICE ACCEPTABLE LIST

Type, Class	Grade	Stick Count	Velocity	Kind	Use
	Percent		100 feet per sec.		
A 2	20	105-115	65- 90	Ammonia	Stump, soft rock
B 1a	20	105-115	95-135	Nitrostarch	Stump, soft rock
B 1b	20	105-115	70-100	Nitrostarch	Stump, soft rock
A 4	30	85- 95	130-175	Amm. gelatin	Rock work, wet
B 1a	30	105-115	100-135	Nitrostarch	Stumps, soft rock
B 1b	30	112-122	85-115	Nitrostarch	Stumps, soft rock
A 2	30	105-115	77-110	Ammonia	Stumps, soft rock
A-2	40	105-115	90-120	Ammonia	Blockholing, quarry and general use, dry
A 3	40	88- 98	145-195	Gelatin	Same as A2; use only if A2 unavailable
A 4	40	88- 98	130-175	Amm. gelatin	Rock work, wet
B 1a	40	105-115	110-150	Nitrostarch	General use, dry
B 1b	40	117-127	100-135	Nitrostarch	Stumps
B 1c	40	122-132	100-135	Nitrostarch	Stumps
A 1	50	103-111	140-190	Straight nitrog.	Ditching, wet
A 2	60	107-117	120-160	Ammonia	Mudcapping, hard rock
A 3	60	93-103	180-240	Gelatin	Same as A2; use only if A2 unavailable
A 6	60	114-126	110-150	Amm. semigel.	Hard rock
A 4	60	95-105	155-210	Amm. gelatin	Hard rock
A 5	60	124-136	90-120	Low Dens. Amm.	Stumps and rock
A 5	60	145-159	80-115	Low Dens. Amm.	Stumps
A 5	60	164-180	75-105	Low Dens. Amm.	Stumps
B 1a	60	110-120	125-170	Nitrostarch	Hard rock, ditching, mudcapping, dry
B 1b	60	120-130	105-145	Nitrostarch	Stumps and rock
B 1c	60	120-130	105-145	Nitrostarch	Stumps and rock
B 1d	60	124-136	100-140	Nitrostarch	Stumps and rock
B 1d	60	145-159	95-125	Nitrostarch	Stumps
B 1d	60	164-176	80-110	Nitrostarch	Stumps
A 7-	20		35-50	Ammonia	Blasting soil
A 7-	30		35-50	Ammonia	Blasting soil
A 7-	40		40-55	Ammonia	Hard rock
A 7-	60	Bag	45-65	Ammonia	Hard rock
B 2b	20	Powder	70-100	Nitrostarch	Blasting soil
B 2b	30		85-115	Nitrostarch	Blasting soil
B 2b	40		100-135	Nitrostarch	Hard rock
B 2b	60		110-150	Nitrostarch	Hard rock

TABLE 801
SPACING OF DRILL HOLES AND QUANTITY OF EXPLOSIVES FOR TRIAL SHOTS[1]

Type of material	Spacing of drill holes	Quantity of explosive, exclusive of springing	Kind of explosive[2] (Forest Service Acceptable List) Type and Class	Grade
		Lbs. per cu. yd. of burden		*Percent
Any rock difficult to shatter; tree cutting	½ to ¾ of their depth apart	1 to 1¼	A 2, 4, 6, or 7 B 1a, 1b, or 2b	60 60
All medium-hard weathered, or partly disintegrated rock; tree cutting	½ to ¾ of their depth apart	1 to 1½	A 2, 4, or 7 B 1a or 2b	40 40
Ordinary shales, hardpan, etc.	½ to ¾ of their depth apart	⅞ to 1	A 2, 4 or 7 B 1a, 1b, or 2b	30 30
Soft rock	½ to ¾ of their depth apart	¼ to 1	A 2 or 7 B 1a, 1b, or 2b	20 20

[1] See figure 800 for methods of blasting solid rock.
[2] In wet or damp holes that will not be fired within several hours use gelatin dynamite. Ammonia semigelatin and nitrostarch powders can be used in wet work providing they are fired as soon as the round is loaded.

*Article 402 b of the Truck Trail Handbook reads:

Care in blasting to prevent damage to scenery and timber. When blasting is done in the vicinity of timber or other natural features which should be preserved for their scenic or other value, the slowest explosive that will accomplish the job should be selected. When scenic values are very high, great pains should be taken and all shots should be loaded with the minimum quantity that will break or loosen without throwing the material. Unnecessary damage to surroundings is evidence of poor blasting and indicates a waste of powder. Anyone can blast rocks to pieces by using enough powder, but it takes an expert to use the right amount to do the job properly without throwing rocks and debris all over the landscape.

In areas where injured timber is subject to serious attack by insects as, for example, beetle infeseations of white pine, only light shooting will be permitted and shots shall be blanketed as required to prevent damage from flying debris.

3 WAYS TO SOLVE YOUR ROAD MAINTENANCE PROBLEMS NOW!

PHONE,

WRITE

OR

WIRE for the TARVIA Field Man

● With new highway construction limited for the duration to military requirements, the proper maintenance of existing roads is more important than ever. Strategic cross-country highways and vital feeder roads must be kept in first class condition to assure mobility for soldiers and industrial workers; for munitions, food and essential supplies.

The responsibility rests with every highway engineer and contractor. Are the roads in your district ready?

There's a grade of Tarvia* just right for every rebuilding, resurfacing or patching requirement. For nearly 40 years this versatile paving material has been helping highway engineers save heavy annual replacement costs and get the most miles out of available highway funds.

Why not discuss your problems with the Tarvia field man? He's ready with helpful, sound advice and cooperation on any highway maintenance problem. All you have to do is phone, wire or write our nearest office. . . .

Barrett Tarvia*

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SEND FOR THE NEW BARRETT TARVIA MANUAL →

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*Reg. U.S. Pat. Off.

A Manhole Cover of Treated Wood

A hexagonal-shaped cover is trimmed to size with a band saw

FACED with the urgent necessity of building many additional miles of sewer line to serve thousands of incoming war industry workers who have settled in unincorporated areas, the engineers of Los Angeles County have designed a pressure-treated wood manhole cover and concrete frame that save approximately 500 lb. of metal.

The cover is made with laminated wood strips fashioned in either hexagonal or circular shape. Plans call for nailing the 2-in. by 4-in. by 8-in. laminated strips with four 20 penny nails to each strip, and running at least two ⅜-in. bolts through all members, countersinking both bolt ends. Where it is difficult to secure nails and bolts, Los Angeles officials point out that county and city engineers can use wood dowels and waterproof glue.

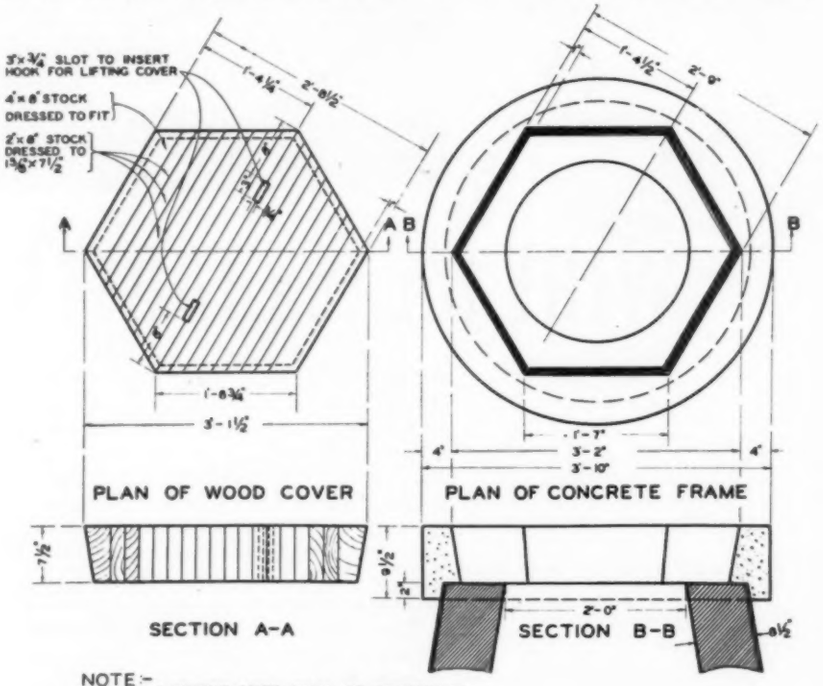
Alfred Jones, County Surveyor and Engineer, and C. E. Arnold, Chief Deputy, supervised the development.

The hexagonal cover is 37½ in. in overall diameter and is 32½ in. between opposite faces. Faces are 18¾ inches. Two lifting slots, each 3 in. by ¾ in., are set in 8 in. from the opposite corners. Weight of the metal-bound cover is approximately 130 lb.; the glued-in dowel cover weighs slightly less. Lumber requirements total 63.3 board feet of No. 1 common Wolmanized or creosoted Douglas fir. The frame uses 0.14 cu. yd. of class "A" concrete.

Two ¼-in. reinforcing rods are used in the concrete retainer—one in the upper and one in the lower section—inside the perimeter. About 24 ft. of rod is required to permit overlapping the ends. The six sides of the cover are faced with ¼-in. plywood when pouring the concrete, to give ample space for expansion and contraction between the cover and retainer. Circular covers may be used as inside forms by tacking roofing paper to them for ¼-in. clearance.

Preservative treatment of the wood by a pressure-impregnation process in accordance with American Wood-Preservers' Association standards is specified because decay and termite attack at the edges of the unit would seriously reduce the safety and useful life of the cover.

Wear and splintering of the wood is reduced by laying the laminated strips at a 45-degree angle to the line of traffic, applying a thin coating of bitumuls or emulsified asphalt —covered with dry sand or pea gravel—to the top surface of the wood cover, and keeping the surface of the cover flush with the roadway.


3"x¾" SLOT TO INSERT HOOK FOR LIFTING COVER
4"x8" STOCK DRESSED TO FIT
2"x8" STOCK DRESSED TO 1⅜"x7½"
PLAN OF WOOD COVER
PLAN OF CONCRETE FRAME
SECTION A-A
SECTION B-B

NOTE:-
1. MANHOLE COVER SHALL BE CONSTRUCTED OF 2"x8" AND 4"x8", S4S, No 1 COMMON, DOUGLAS FIR, WOLMANIZED OR CREOSOTED.
2. COVER SHALL BE NAILED TOGETHER WITH 20d COMMON NAILS, AT LEAST 4 TO THE BOARD.
3. ALLOW ¼ CLEARANCE ON ALL SIDES BETWEEN COVER AND FRAME.
4. CONCRETE SHALL BE CLASS "A".
5. ALL CUTS SHALL BE TWICE PAINTED WITH WOLMAN SALTS SOLUTION OR CREOSOTE.
6. WHERE COVERS ARE TO BE MANUFACTURED IN LARGE QUANTITIES THE COVER SHALL BE MADE CIRCULAR WITH A BOTTOM DIAMETER OF 2'-9" AND A TOP DIAMETER OF 2'-11" AND THE INSIDE DIAMETERS OF THE FRAME SHALL BE ½" LARGER.
7. 2-⅜" ϕ STEEL REINFORCING RODS SHALL BE PLACED ONE IN THE TOP AND ONE IN THE BOTTOM OF THE CONCRETE FRAME, WHEREVER CLIMATIC CHANGES ARE SEVERE ENOUGH TO CAUSE EXCESSIVE EXPANSION OR CONTRACTION.

REVISED AUG 1942, REVISED JULY 1942.

WEIGHT OF MANHOLE COVER = 130 LBS.
BOARD FEET OF LUMBER IN COVER = 63.3
VOLUME OF CONCRETE IN FRAME = 0.140 CU. YDS.

Plan and section of special wood manhole covers and concrete frame

Care and Repair in Shop and Field

CONSTRUCTION EQUIPMENT MAINTENANCE

A SPECIAL SECTION OF ROADS & STREETS

Care, Repair and Maintenance of Equipment

◆ ◆ ◆

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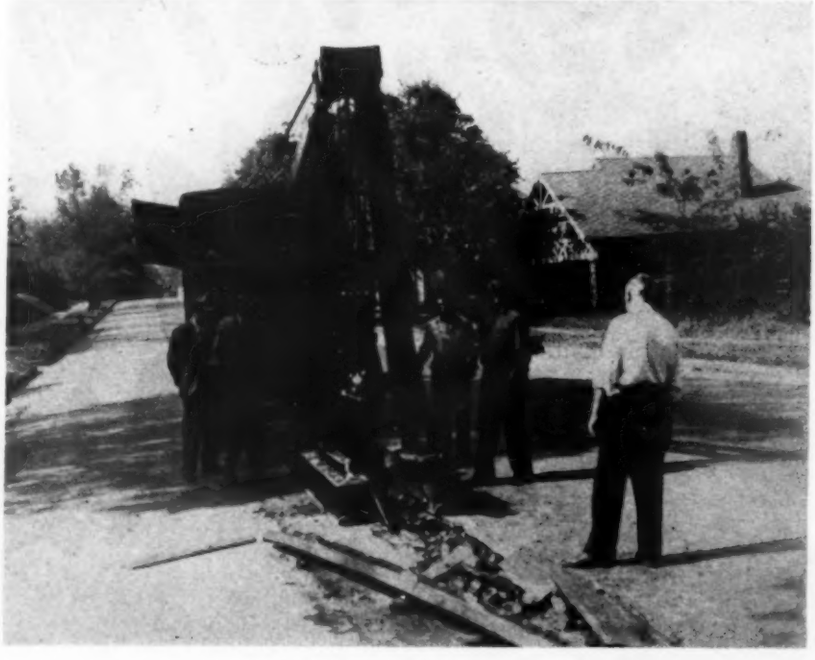
Salvaging Street Railway Rails

In salvaging some 4,060 tons of rails from a street car line in Birmingham, Ala., an interesting method was used whereby the rails were yanked out by machine with little damage to the paving.

This work in Birmingham as in other cities was financed by the Metal Reserves Corporation, an RFC subsidiary, under an agreement with the city to repave the streets. Under the direction of J. D. Webb, City Engineer, the contract was awarded to Coosa Construction Co., of Gadsden, Ala., which in turn sub-contracted with Victory Rail Puller Corporation of Philadelphia to pull the rails.

Power for the operation was furnished by a Browning crane to whose boom was attached a special type rail puller. Two I-beams are placed parallel with the rail to be pulled and about 9 in. therefrom on each side. An A-frame attached to the end of the boom holds the I-beams securely and the latter shear off the pavement as the block and tackle, with grab, drags the rail out of the street. Thus a minimum amount of pavement was torn up, this being replaced immediately with asphalt.

The rail as salvaged was immediately shipped to mills needing it most for war purposes. The first shipment of 500 tons went to a Birmingham mill, but much of the total tonnage was shipped to northern mills.



Equipment Maintenance

Tractor Roller Bushing and Other Parts Cast From Home-Made Patterns

ONCE upon a time when a county shop mechanic needed new bronze bushings for tractor rollers, he just signed for 'em in the stock room. Or, if parts were running low, an order into the factory brought them in a hurry.

Today this is one of the growing legion of replacement parts that mere purchase orders cannot supply—but shop ingenuity *can*. The Dodge County highway garage crew at Juneau, Wis., for example, recently made 35 roller bushings for a Caterpillar D 8. The first step was to make a pattern in their well equipped woodworking room. This pattern, together with a supply of old bushings and other saved-up pieces and bits of bronze, was sent to a foundry nearby, where the metal was used to make new castings. Back in the shop, Superintendent Reuben Kuntz then put the rough castings on his 28-in. lathe and finished them to the required 0.005 inch inside and 0.0015 inch outside tolerance.

Patterns for Many Other Parts

Roller patterns are simple compared to others this shop has made for hard-to-get parts. One of the most intricate is for a new cast iron guard for the shop's circle saw *(No. 1 in the photograph)*. Thirty-five new grate bars in the shop's Kewaunee boiler were made from a home-fashioned pattern *(No. 2)*. Patterns needed have also been made for a standard-type pillow block, for conveyor shafts, etc. *(No. 3)*, a towing hitch for a snow plow *(No. 4)*, and many other items for which castings will serve. The largest is for a new wedge block for the county's big gravel plant crusher.

The woodworking layout includes a jointer, circle saw, band saw, planer, boring machine and hand tools.

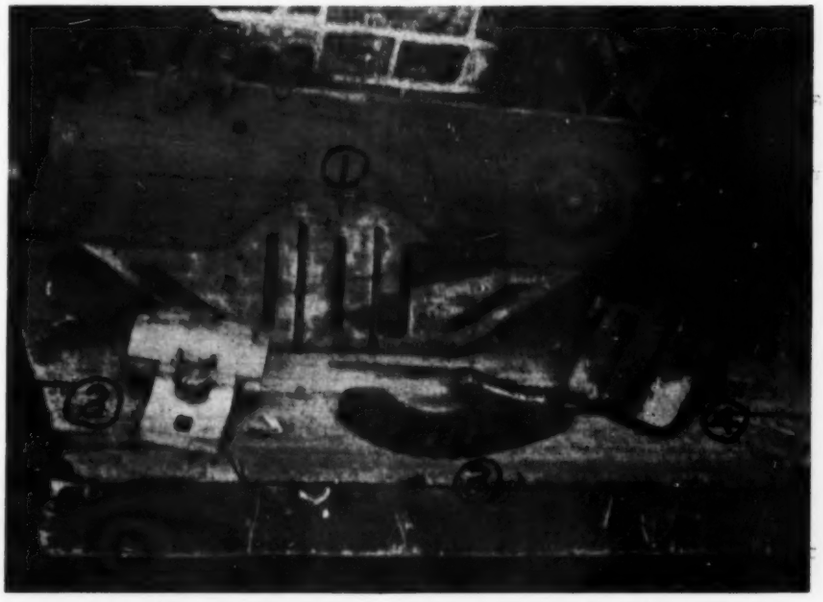
Cutting bronze bushings for tractor rollers on the Dodge County shop lathe

Save All Babbitt, Bronze, Etc.

This shop makes numerous brass, bronze and copper fittings from stock or scrap. The men have learned to keep an eye peeled for even the smallest fragments of such metal, which are systematically saved for supplying the brass foundry along with casting orders.

Dodge county's metal working equipment includes a heavy-duty 28-inch lathe, small lathe, milling machine, combination punch and shear, trip hammer, two drill presses, 60-ton hydraulic press, power hack saw, cylinder grinder, key seater, valve refacer, threading machine, twin hydraulic lift, emery wheels, two electric welders (one for shop and one portable), two acytelene welders including one portable.

Lavern Kohn is Dodge County highway commissioner.



Home-made wood patterns for casting iron, steel or bronze parts the factory can no longer supply

How Trucking Company Cut Tire Replacements 52%

A TIRE-SAVING program by the U. S. Truck Company, Detroit, Michigan, one of the largest motor common carriers in this country has reduced truck and trailer tire replacements 52 per cent within a year.

Under this plan every driver is made responsible for the continued inspection of the tires on his own vehicle. Disciplinary measures were instituted to make sure that the inspections are properly carried out.

The tire conservation program was started by R. F. Jones, President and General Mgr. of the company, and was placed in operation within a few weeks after the attack on Pearl Harbor. It has been continued vigorously despite the high turnover in drivers and the difficulty of securing sufficient skilled help.

R. F. Jones

Main Features of Conservation Program

The main features of the program are as follows:

(1) Each driver is equipped with a tire gauge which carries a serial number. On Tire Failure Reports the driver has to report the serial number as evidence that he had the tire gauge available at time of tire failure. Inflation of tires checked at each terminal before vehicle dispatched on highway trip.

(2) Recapping done before breaker strip shows. Best results accomplished when recapped as soon as tread design had disappeared. This avoids picking up of foreign material and cuts, which may make the tire unsuitable for recapping.

(3) Systematic rotating of tires as follows:

a. New tires every 4 months on front tractor wheels.

b. Recapped tires in fall only on semi wheels and front wheels of trailers.

c. Old tires unsuitable for recapping run out on rear wheels of trailers.

Accurate record system of changes, repairs in order to make sure that:

a. Repaired tires are put on outside dual position with repairs facing inside. To recognize these repaired tires permanently, they are painted with two yellow stripes on the side where the repair was made.

b. Tires with old repairs or which have run continuously on inside dual positions are recapped only if carcass in good condition (otherwise they will cause premature blow-outs, due to tread separation and loose ply).

c. Tires are switched to best locations according to age and history. The forms, shown as Figs. 1 and 2, are used for Local Station and Operating Department reports.

Explicit information about tires is furnished to drivers and small terminals where tires are changed in the form of two instruction sheets entitled "The Heat Is On" and "Changing Tires and Mating Tires." These are reprinted elsewhere in this article.

6. Promote tire consciousness with drivers by:

a. Checking their gauges and driving habits frequently.

b. Making them fill out a Tire Failure Report on all permanent failures, causing road calls (see Fig. 3).

The accomplishment of this tire conservation is especially noteworthy because the U. S. Truck Co. is one of the few large Midwestern haulers which is operating with full-automatic 5th wheels and also semi-trailer and 4-wheel trailer train combinations. Both these systems are somewhat harder on the tires used but in the overall they require of course many less tires per tonnage moved.

Mr. Jones, the President and General Manager has consistently pioneered in these features in order to speed up the intricate hauling problems from conveyor line to assembly line in the Automotive Industry in and around Detroit. It is accomplished with approximately 20 per cent less tires than if the U. S. Truck Co. would operate tractor and semi-trailer combinations only.

Changing Tires and Mating Tires

In spite of frequent previous instructions, there still seems to be uncertainty as to proper procedure when changing and inflating tires. Will you, therefore, please *keep the following instructions displayed in your office*, and refer to them carefully whenever in doubt:

Six o'clock TIRE SITUATION REPORT

_____ Station Date _____

TIRES CHANGED DURING LAST 24 HOURS

Item No.	Unit No.	Wheel Pos.	TIRES REMOVED FROM VEHICLES				TIRES MOUNTED	
			Size	UST No.	Nature of Failure	Disposition	UST No.	By Whom

SPARE TIRES AT HAND at close of business			
Size	UST No.	Size	UST No.

Remarks to Item No.

Signed: _____

*If account Accident state "See Accident Report"
If to be investigated, fill out and attach "Damage Report" form

Fig. 1.—Six o'clock tire service report

High Pressure Tires

700x20 or 32x6—80 lb. Inflation

750x20 or 34x7—85 lb. Inflation

These are extra service High Pressure tires. Many of them are marked with both sizes: 700x20 and 32x6 (or 750x20 and 34x7) indicating that there is no difference between a 700x20 and a 32x6 (or 750x20 and 34x7) as long as they are 10 ply tires.

They carry a higher inflation than the Low Pressure, or Balloon tires, because they are smaller in circumference.

The *front wheels of tractors* are the only location where the pressure *should be kept at 60 lb.*, and not at the regular 80 or 85 lb. Sixty pounds will reduce unnecessary pounding of the front end of the tractors.

Low Pressure Tires

825x20 and 900x20—70 lb. Inflation
975x20 and 10.00x20—75 lb. Inflation
10.00x22 and SS42—80 lb. Inflation

These are Balloon tires which require a lower pressure because of larger circumference. On front wheels of tractors they too may be kept at 60 lb. pressure because the front end never carries the full capacity weight of the tires.

Interchangeability of 975x20 and 10.00x20 Tires

To make this clear, note that the 975x20 size was discontinued in January, 1940, and replaced by the manufacturers with the 10.00x20 size, which is not "supposed to be" larger.

Generally, therefore, a 975x20 tire can be placed alongside a 10.00x20 tire. However the new Goodyear 10.00x20's are definitely larger than the old 975x20's or the new 10.00x20 All States, and do not work out when paired with one of these.

To make it more confusing, often there is more difference in the size of two 975x20's particularly when recapped, than in the size of a 975x20 and a 10.00x20.

It would not be practical to stock both sizes, the slightly smaller old 975x20 and the large new Goodyear 10.00x20 at the terminals. You simply have to mate whatever you have in stock as well as can be done, and advise us on the SIX O'CLOCK TIRE REPORT if any unit had to be badly mismated. In that way, we can correct this as soon as the unit gets into Detroit.

We shall try, in the future, to send most stations well mated pairs. Then you can put both tires on a unit when one tire would cause an uneven pair. The two tires removed should go back to Detroit for replacement with another pair.

General Hints

On all *semis and trailers* the outside tire should be the slightly larger one of the two. The difference, however, should never be more than ¼" in radius. On *most tractors*, on the other hand, it is a peculiar fact that the inside tire should be the larger one. Experts agree that the outside tire on tractor drive wheels is wearing faster (the opposite on semis and trailers). It would, therefore, be waste of rubber to put a larger tire on the outside position of tractors. *A tire with a section* or other repair, should always be put on the outside position because the harder wear and excessive heat on the inside position would break down repaired tires prematurely.

The days are gone when a driver "figured that 60 pounds or similar" is sufficient. We must learn to keep within five pounds to above pressures, no more—no less. EACH TIME A DRIVER CHECKS INFLATION WITH A MERE KICK OF A SHOE, he might as well realize now that HE IS GIVING ONE OF OUR FRONT LINE SOLDIERS A *KICK IN THE PANTS.*

If the above information is not clear, please write for further details.

July 2, 1942

The Heat Is On

Heat and Speed are the worst enemies of TIRES!

In order to conserve our tires during the months of July and August, the maximum speed allowed is reduced to:

30 Miles per hour, for
any single mile traveled

The tire situation is so serious that from now on *government officials are looking over all reports of tire failures.* Each tire lost due to carelessness or abuse is going to be deducted from our replacement certificates. Accordingly, a *DAMAGE REPORT* must now be filled out by the driver, signed by the Manager or Superintendent, each time a tire blows out or is run flat beyond repair *describing briefly the cause of the failure.*

Date_____

DAILY REVIEW OF TIRE SITUATION

Unit	Tire Size	U.S.T. No.	Location of Failure	Nature of Failure	Disposition

SUMMARY OF DISPOSITION:

Sectional repairs _____
To be recapped _____
Return to stock _____
N.G.—Beyond repair _____
Total _____

TOTAL TIRES BEYOND REPAIR SINCE JANUARY 1 _____
" " " " " _____

NEW TIRES MOUNTED_____on_____
CHANGED FOR RECAPS_____on_____
REMARKS_____

Present Spare Stock

at DETROIT _____
" LANSING _____
" GD. RAPIDS _____
" MUSKEGON _____
" JACKSON _____
" BATTLE CREEK _____
" PONTIAC _____
" FLINT _____
" SAGINAW _____
" PT. HURON _____
" TOLEDO _____
TOTAL _____

Fig. 2.—Daily review of tire situation

Hot Weather Recommendations

(1) *Be more accurate when inflating:* Use your gauge, don't kick, and maintain these pressures.

U. S. TRUCK CO. INC.
DETROIT, MICHIGAN

TIRE FAILURE REPORT

DATE ___/___/___

U S T BRAND NO. _____ RECAPPED BY _____ AGE ____ YRS. ____ MO. (If recapped, recap age only)

TRACTOR SEMI OR TRAILER NO. _____ WHEEL POSITION _____

DRIVER'S NAME _____ FAILURE HAPPENED WHERE _____ WEIGHT OF LOAD _____ WAS LOAD DISTRIBUTION UNEVEN _____

CHECK TYPE OF FAILURE WITH CROSS(X):

BLOW OUT due to
- ☐ 1. Shoulder break
- ☐ 2. Star Break
- ☐ 3. Tread Separation
- ☐ 4. Ply Separation

BLOW OUT due to
- ☐ 5. Repair Failure
- ☐ 6. Bead pulled out
- ☐ 7. Cut
- ☐ 8. Overloading

RUN FLAT due to
- ☐ 9. Puncture
- ☐ 10. Leaky Tube
- ☐ 11. Leaky Valve
- ☐ 12. Valve Stem

WORN OUT due to
- ☐ 13. Normal Old Age

DAMAGED BY
- ☐ 14. Defective Brakes
- ☐ 15. Broken Spring
- ☐ 16. Front end of Frame

DEFECT
- ☐ 17. Manufacturer
- ☐ 18. Recapper
- ☐ 19. ACCIDENT
- ☐ 20. _____

IMPORTANT

NOTICE TO DRIVERS
Please fill out this part, sign below and return Form to MAIN OFFICE, DETROIT

EXPLAIN CAUSE OF FAILURE _____
(Mention if condition of equipment faulty)

Tire inflation was last checked where _____ BY WHOM _____ DID YOU HAVE A TIRE GAUGE WITH YOU AT TIME OF FAILURE ☐ yes ☐ no

IF TIRE GAUGE NOT AT HAND, EXPLAIN WHY _____ WHAT IS THE NUMBER OF YOUR TIRE GAUGE _____

REMARKS: _____
SUGGESTIONS:

I HEREBY PLEDGE TO DO ALL IN MY POWER TO PROLONG THE LIFE OF ALL TIRES WHILE THEY ARE ENTRUSTED TO MY CARE.

DRIVER'S SIGNATURE _____

MFH:KL 11-42

Fig. 3.—Tire failure report

High Pressure Tires
700x20 or 32x6—80 lb.
750x20 or 34x7—85 lb.

Low Pressure Tires
825x20 and 900x20—70 lb.
975x20 and 10.00x20—75 lb.

Keep within 5 lb. of these pressures —no more, no less.

On long runs and narrow roads, carry 5 lb. more pressure in outside tire of duals.

Carry 10 lb. less pressure in front tires of tractors for smoother riding.

(2) *Don't Bleed a tire, when hot* (no matter how high the pressure increased). It is better to *add 10 lb. when a tire is heating up abnormally.*

(3) *Load evenly* and avoid piling most of the weight on one axle or in one corner. *Load the high side (left) a little heavier* than the low side, and *keep it that way.*

(4) Don't run capacity loads longer than 75 miles without stopping to check inflation.

(5) Carry a couple of valve caps in your equipment so you can stop a leaky valve.

R. F. Jones

REMEMBER
30 M.P.H. IS TOPS

Inspection and Maintenance of Crushing, Screening and Washing Units

By A. B. SHUFELDT
President
Universal Road Machinery Co.

1. All equipment should be kept well lubricated continually to avoid all possible wear, especially in sand, gravel, and stone plants because of the abrasive nature of the material being handled.

2. All bearings as well as other moving parts should be checked thoroughly not less than once a week for wear and where this is excessive should be repaired or replaced promptly.

3. All bolts and nuts should be tightened daily to avoid vibration and consequent damage.

4. The entire plant should be kept in alignment, particularly referring to pulleys and belts and sprockets and chains as this will also avoid unnecessary wear and give maximum results.

5. The feed or load on the units should be kept as uniform as possible as normally the shock and wear is much greater with an intermittent load than where the load is uniform.

6. The equipment, particularly referring to the crusher should be mounted on wood skids or some other resilient base and not attached directly to any firm foundation such as concrete as this will tend to take up the shock load and reduce the wear and strain to a large extent.

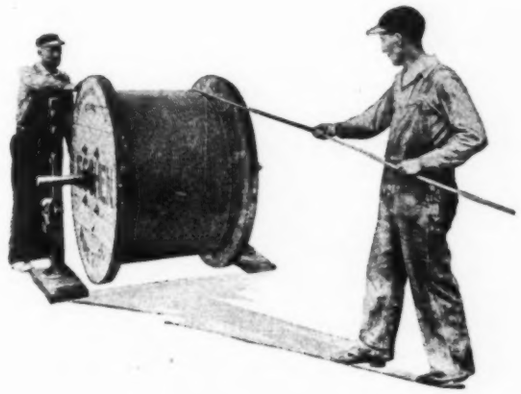
7. All dust or fines should be cleaned out daily from beneath the crusher and from all pits in which the mechanism operates to avoid undue strain and wear at these points.

8. A minimum stock of the parts most subjected to wear should be maintained so that replacements may be made before the old parts actually wear out completely or break.

9. By following the method outlined in No. 7 quite often, referring particularly to shafts and certain bearings, the old parts can either be remachined for additional wear or built up for further service provided they are not allowed to operate to such an extent that they cannot be reclaimed.

How To Unreel and Uncoil Wire Rope

Wire rope must not be unreeled or uncoiled like a hemp rope, for it will kink or untwist. When on a reel, mount the reel so that it will revolve and run the rope off slowly straight ahead. When in a coil, roll on the ground like a wheel or hoop. If wire rope is to be coiled or reeled after being used, reverse the operations.

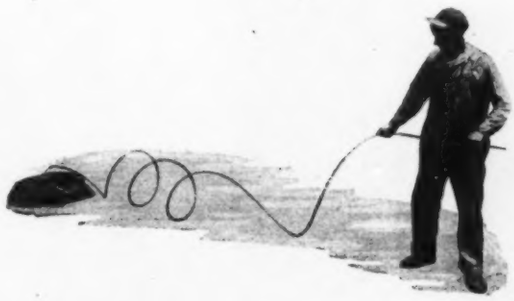


This is the way wire rope should be taken from a reel

Note: When taking a rope off a reel to put on a drum, it is advantageous to have the rope wrapped on the drum in the same direction that it was wrapped on the reel. For example, if it overwinds on the drum, it should be taken off the top of the reel; if it underwinds, then off the bottom of the reel.

The wrong way to take wire rope from a reel

The right way to uncoil wire rope is shown at left



Never uncoil wire rope in the manner pictured at the right

The above instructions are from "Practical Information on the Use and Care of Wire Rope" by A. Leschen & Sons Rope Co. of St. Louis.

Thankful for Re-cappers

"The American public owes a debt of gratitude to a little band of men who were unknown until the misfortunes of war cut us off from our normal crude rubber supply," says Harry C. McCreary, veteran manufacturer of McCreary tires. "These men, often brushed aside by old-line tire manufacturers and dealers during the lush days before the Japanese invasion of Malay, are the re-cappers.

"It was only humanly selfish that tire manufacturers and dealers preferred to sell new equipment to truckers, farmers and passenger car owners. Plenty of crude rubber was in sight, so why conserve it?

"The fact that this group of re-cappers did a good business, however, even during the period of plentiful rubber shows how economically sound the process of re-capping tires really is. Fleet operators have frequently secured 30,000 or more miles on a re-capped tire and there are cases on record of over 100,000 miles on re-capped tires on truck-trailers.

"For those who must operate their fleet economically in order to secure the savings necessary for profitable operation, re-capping has come to be more and more recognized as of real value. Today, in view of the shortage of rubber, it has become mandatory. Even after this crisis has passed the education in the value of re-capping will suffice to make it a permanent institution in many fields where it previously had never been considered.

"But—what a fortunate thing it is for all of us that the art of re-capping had been developed commercially before the crisis occurred! This relatively small band of men throughout the country, who had been offering this service at a time when they ran counter to the business efforts of many powerful organizations, deserves our gratitude today!"

Electrode Holder for Welding

The following suggestion is one of many hundreds received by the War Production Drive Headquarters in its campaign to speed war work.

An electrode holder for welding, devised by cutting off jaws of worn out tongs, drilling a hole in rear part which accommodated the electrode. A square fibre was inserted on handle to keep electrode holder from rolling as well as grounding on metal.

Result: Standard tongs usually returned to Repair Dept. every three days formerly. New holder prevents this and also adds a safety feature which stopped rolling and grounding.

Repairing Construction Equipment By Welding

THE contractor today has a vital part to play in the conservation of war materials and production time. He must keep the equipment he now has in good working condition.

The following suggestions and illustrations indicate types of parts that can be repaired, restored, or rebuilt by oxy-acetylene welding.

Repairing

Welding makes possible the joining of any metals, like or unlike, so that the weld is as strong as the base metal.

Fig. 1—After the broken spoke of this cast iron gear was repaired by welding, it was just as strong as it was originally, and the gear was true and round. Here the fracture is shown beveled for welding.

Fig. 2—This fractured malleable iron arm on a road plow was returned to service considerably stronger than when new. First, the center ribs were cut from the arm for a distance of about 8 in. on either side of the break, and the crack was then veed and welded. As additional reinforcement, since the plow is subject to heavy abuse in operation, four short lengths of steel bar stock were then placed around the repaired section and welded to it.

Fig. 3—Welding was used to repair successfully this broken cast iron transmission housing on a tractor. The rough edges of the break were smoothed by chipping and grinding. Then the missing vertical section was rebuilt by depositing successive layers of the weld metal, as shown in the photograph, thus effectively restoring the damaged housing to full strength.

Fig. 4—Welding effected the salvage of this 15-ton crane base in which several large cracks had developed, avoided a paralyzing shutdown, and saved about $2,400. The base was in bad condition—four cracks, 8 ft. in overall length appeared in the casting, and two seams had opened on its surface. The damaged base was set on its side in a good welding position. Then it was chipped and veed, as shown in the picture, locally preheated, and finally welded. The actual welding time with two operators was 10 hr.

Rebuilding

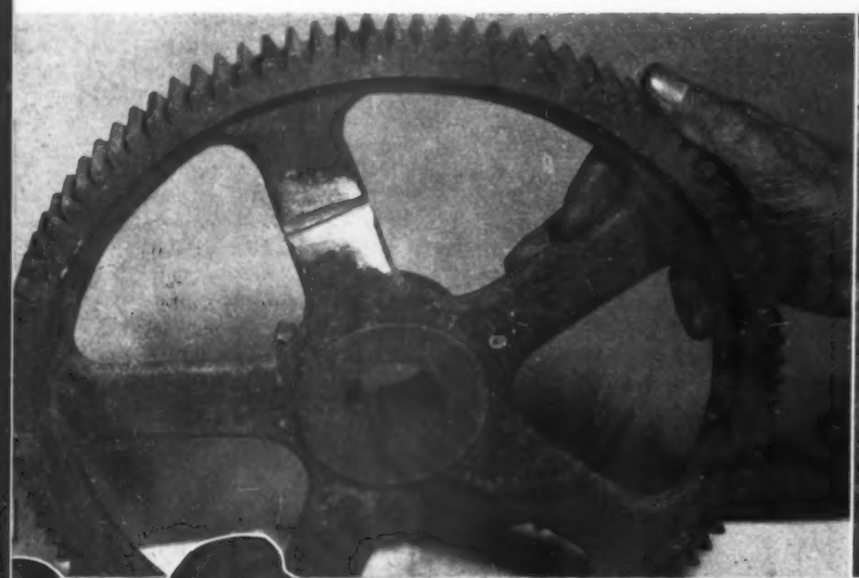
Welding can be used effectively in rebuilding parts that have become worn in service and sections of castings that have broken away under stress. It avoids delays and conserves materials.

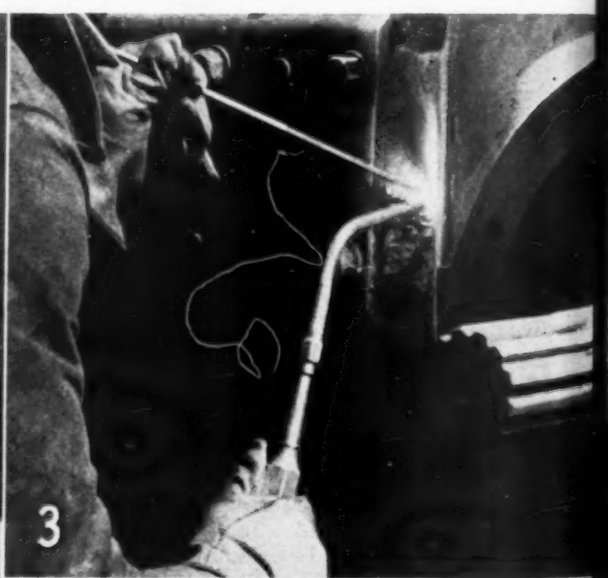
Fig. 5—The tooth at the top of this cast iron spur gear has completely broken out.

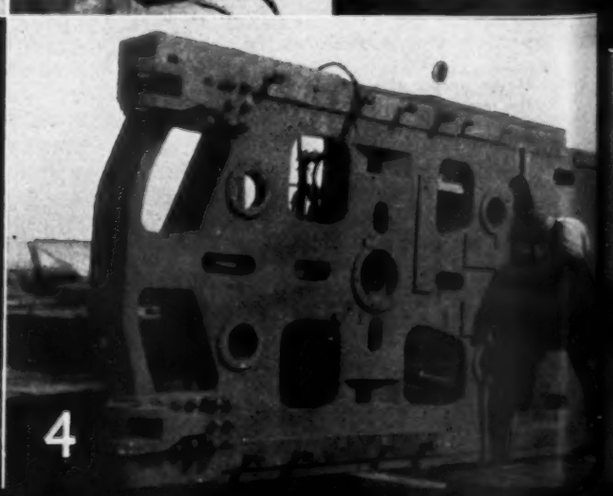
Fig. 6—After being cleaned and locally preheated with the blowpipe, the tooth was built up by depositing the metal of the welding rod in a series of ripples.

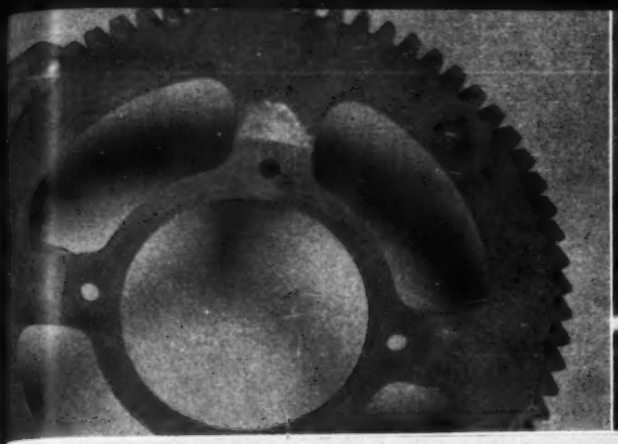
Fig. 7—Here is the tooth as machined. It is as strong as the adjacent teeth and will wear just as long, if not longer.

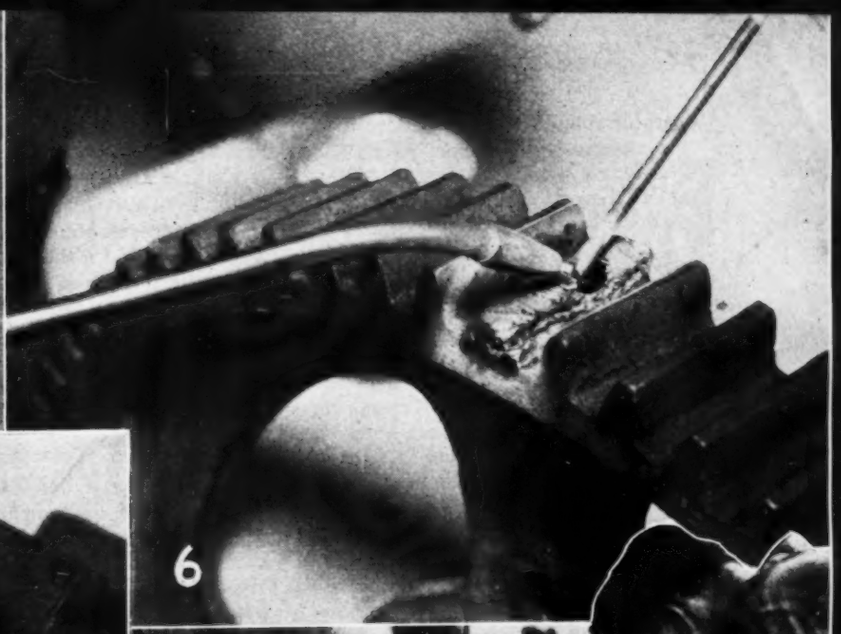
Fig. 8—Without removing the gear from the transmission, the welding











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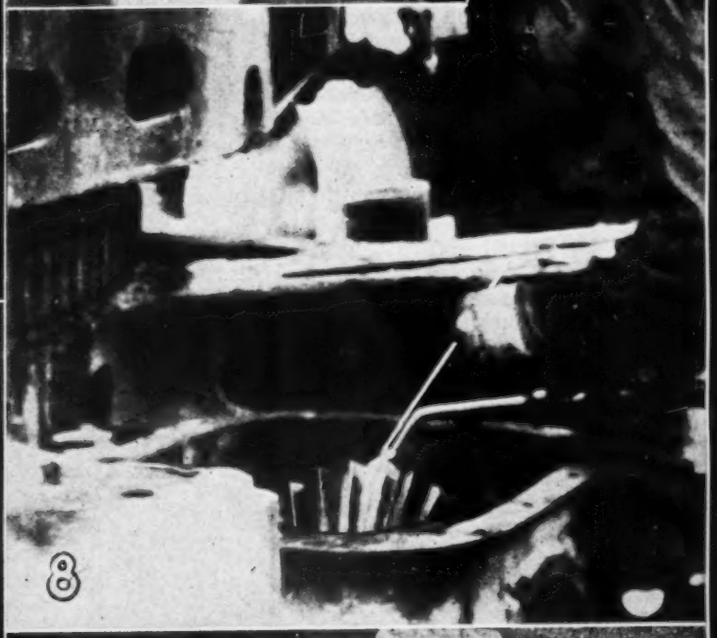

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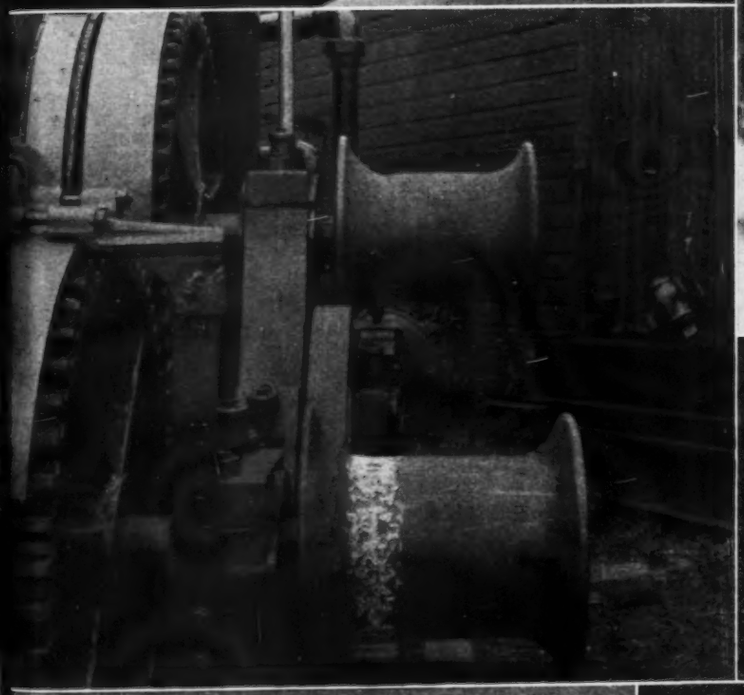

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12-1

12-2

operator rebuilt four broken teeth of this power-shovel pinion gear. The time saved was considerable—3 hrs. for welding as compared to several days (or weeks, considering the present scarcity of replacement parts) it would have taken for removal and replacement.

Fig. 9—The projecting sheaves, or spools of pile-driver winches become deeply grooved, as can be seen by the sheave in the background. The sheave in the foreground has been built up by welding (chalking shows treated area). This gives an even, tough surface that withstands the constant friction of the heavy hoisting rope.

Fig. 10—When the bearing area of these driving shafts for a crane became worn in service, they were rebuilt without distortion using a welding rod especially developed for surfacing parts subject to sliding friction. The shafts are shown here after surfacing and before machining. It took the operator only ½ hr. to surface each of the worn areas, which measure 6 in. in length and 5 in. in diameter.

Fig. 11—Ripping up old pavement presents a difficult wear problem because paving is abrasive and packed hard. In one western city the standard steel scarifier teeth became so hot in such work that the points wore off in 2 to 4 hrs. If the ends of the teeth are built up and then hard-faced with an abrasion-resistant welding rod to a depth equal to that of the pavement, the teeth will last about eight times longer than the standard teeth. Illustrated are: 1—plain steel scarifier tooth after one shifts wear; 2—rebuilt and hard-faced scarifier tooth after two shifts' wear.

Building Up Wear Resistance

Parts that are subject to severe abrasion wear out quickly. Protecting these parts prolongs their life and cuts repair bills. There are two ways of building up wear resistance using welding processes: 1—using cast iron or steel welding rods and then flame-hardening the welded deposit; 2—using standard hard-facing alloy welding rods. Where hardness alone is required, cast iron or steel rods can be used satisfactorily; but when unusual conditions of abrasion and wear prevail, hard-facing alloys should be used.

Fig. 12—Hand shovels wear down rapidly on many construction jobs. Hard-facing increases their service life to such an extent that frequently shovel costs are cut in half. Illustrated on the left is a hard-faced shovel after 30 days' use. The chalk line indicates the extent of the hard-facing alloy deposit. On the right is an ordinary steel shovel after 30 days' use. Best results are obtained if the hard-facing alloy is applied to the back of the digging edge only, covering the area indicated by the chalk lines.

Fig. 13—When shovels are inclined to wear at the heel, or underside, wear resistance can be built up by welding straps of iron to the wear areas or by hard-facing these areas as shown in the picture.

Fig. 14—After being hard-faced, the teeth and side shoes of this skimmer scoop are in perfect condition after 15 weeks of use.

Fig. 15—Tractor and crane parts such as rollers and idler wheels that normally wear rapidly can be built up, flame-hardened, and returned to service at about half the cost of replacement parts. When rollers are reconditioned, they are first rebuilt with high-carbon steel rod and then machined to size. Then they are flame-hardened, as shown in the illustration, in apparatus specifically designed for treating the rollers. They are as good if not better than new.

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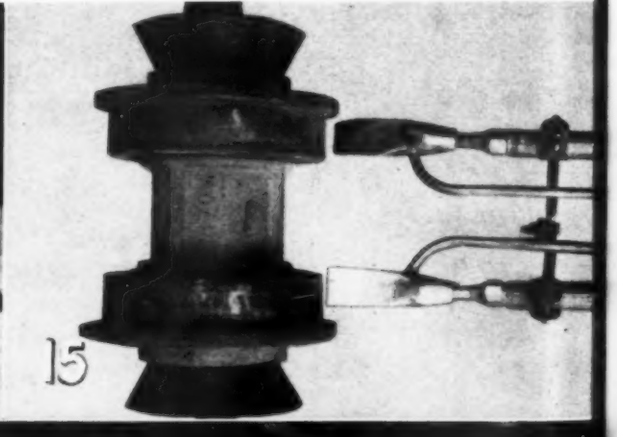
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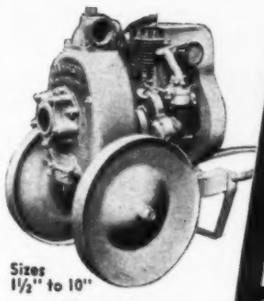
Right Handling of Friction Materials

"Good Operating Practices," a pamphlet issued by Johns-Manville, of New York City, contains the following section on friction materials:

How to Make Brake Linings Last Longer

1. The capacity of any clutch or brake is its ability to dissipat heat. Heat is best disposed of by convection—take very possible means of increasing air flow around clutches and brakes to get rid of heat.
2. Guard against high temperature in brakes or clutches as it may cause:
   a. Wide variation in friction. b. Rapid wear of ffriction material. c. Possible scoring of metal surface. d. Possible heat checking of metal surface. e. Failure of bearings
3. Do not use oil, clay or other foreign substances on friction material surfaces in order to control friction. Widely fluctuating brake action will result and probably necessitate lining replacement.
4. Be sure brakes and clutches are properly adjusted. Unequal adjustment causes unequal wear and inefficient and noisy operation.
5. True up badly scored or heat-checked rims with whetstone if portable grinders or other equipment are not available. Rims in this condition can cause rapid wear of friction materials.
6. Check bands for being out of round or kinked when relining. Such conditions create local high pressure areas, rapid wear, excessive heating, noisy operation, short life.
7. Bear in mind that increasing the width of a brake does not increase its braking capacity. It simply reduces unit pressure and the brake lining lasts longer.
8. Greater brake capacity can be provided by increasing diameters or torque arm, or total pressure.



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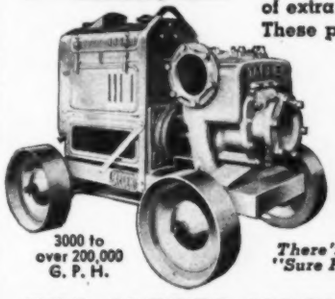

offer you factory-tested and certified high performance in units of extra heavy duty construction. These pumps are the surest protection your money can buy against pump breakdowns and job delays, the best insurance the contractor can have against the cost and uncertainty of early replacement.

There's a size and type of Jaeger "Sure Prime" Pump to fit any job. Ask for Catalog.

THE JAEGER MACHINE COMPANY
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CONTRACTORS' PUMPS, MIXERS, HOISTS, PAVING EQUIPMENT

Bearings—The Right Way to Replace Them

Bronze Bushings

In bronze bearings in the manufacture of machines, we allow tolerances of 0.003 to 0.006 to an inch. This, in the terms of field work gives a light, free-turning fit on the bearings. As bronze bushings are pressed into place they squeeze together somewhat and always have to be reamed. In most instances we use two short bushings rather than one long bushing and leave a space between the ends of bushings to form a grease well. This means that in using a reamer it should be used clear through the bearing so as to take care of any misalignment of the two bushings. Whenever practical, the reamer should be used through the bearings in the same manner the shaft is going to set into the bearing. This makes more perfect alignment.

In a few cases we set the bronze bushings into a babbitted seat. When this is the case, the bushings should be tapered on the outside edge that is going to enter into the seat first or it may gouge into the babbitted metal. It will cut a groove into the babbitted seat so that the bushings will not be in true alignment with the part it is being pressed into. When pressing bushings into place, care should be taken that they are started straight with the seat or they will become egg-shaped.

Babbitted Bearings

In the manufacture of machines, tolerances are used on babbitted bearings of 0.003 to 0.006 of an inch.

When babbitted bearings are solid, a reamer is used just as though they were of a bronze bearing construction. Where the babbitted bearings are in halves, it is still the best and fastest practice to use a reamer by bolting the halves into the base. In the field, quite often it is not convenient to get a reamer and these half bearings can be scraped to fit the shaft using blueing to find the high spots.

By taking off the high spots and then either filing the edges of the halves or shimming behind them, it is not a long process to make a split bearing fit the shaft. Solid bearings can be scraped to fit in the same manner but generally speaking the process takes much longer and due to the inaccessibility of all parts of the bearings, it is much harder to get as good a job as is gotten by reaming a solid bearing. When scraping bearing halves, at least 50% of the area should bear on the shaft and the most of this area should be in the bottom of the half and not up near the edges. There should not be any rocking motion or any high points which show a hard bearing area on the surface.

We are indebted to Barber-Greene Co. for the foregoing practical instructions. While written for the operator of the B-G. 44C ditcher, these fundamentals apply to general machine overhauling.

WAR SALVAGE ITEM: When additional road-oil storage capacity was needed by the Kenosha County, Wisconsin, Road Department, it found what it wanted in an old 5,600 gallon tank owned by a farmer and lying along a railroad right-of-way. This second-hand tank was recently outfitted with heating coils, for service at the county's gravel pit.

Care of Hydraulic Systems and Lubrication of Earth Moving Equipment

From LaPlant-Choate Manufacturing Co.

The greatest common enemy of LaPlant-Choate hydraulic systems is dirt. Foreign matter, whether it be dirt, dust or grit, wreaks havoc with pressure retaining surfaces such as valves and pumps. When a new installation is made, care must be taken to clean out all ducts, to check couplings for accumulations of dirt and to remove any bits of material which might have become lodged in hydraulic parts.

Whenever a piece of equipment is disconnected from the hydraulic system it is wise to cover the exposed connections so that water will not be introduced into the system.

Should oil spill on any rubber hose or fittings, it should be wiped off immediately as rubber deteriorates rapidly under these conditions. Weakened hose leads to blow outs and loss of time and money.

At the same time that lubrication is being completed, all connections should be checked for leaks. Air causes foaming in the hydraulic medium, oil, which causes heat and an eventual breakdown of oil. When this happens parts wear excessively fast and there is little profit in an idle machine. A little care will go most of the way in eliminating these profit-taking breakdowns.

It is advisable to work the hydraulic systems at as low a pressure as practical, thereby throwing less strain on the pump, valve and hose. Following is a chart for blade equipment mounted for operation.

Tractor	Pressure in pounds
D4	450
D6	450
D7	550
D8	650

All LaPlant-Choate hydraulic scrapers operate at 750 lb. pressure.

LUBRICATION CHART FOR LePLANT-CHOATE EQUIPMENT

Equipment	Grease-gun Fittings	Wheel Bearings	Hydraulic System
Bulldozers Trailbuilders Treedozers Root Cutters	High grade Heavy Grease-gun Lubricant	None	Summer SAE 30-40 Winter SAE 10-20 *Hydraulic-quality oil
Snow Plows Trailbuilder with Snow Plow	High grade Gun lubricant Medium grease	None	SAE 10 *Hydraulic-quality oil
Scrapers Hydraulic C41 C45 C61 C71 TW10	High grade Heavy Grease-gun Lubricant	Medium Consistency Fibre grease	Summer SAE 30-40 Winter SAE 10-20 *Hydraulic-quality oil
Scrapers Hydraulic CW-10	High grade Heavy Grease-gun lubricant	Medium Consistency Fibre grease	Summer and Winter SAE 10 *Hydraulic quality oil
Scrapers Cable C74 C84 C86 C104	High grade Heavy Grease-gun lubricant	Medium Consistency Fibre grease	None
Tampers Rippers	High grade Heavy Grease-gun lubricant	Medium Consistency Fibre grease	None

* Hydraulic quality oil for use in LaPlant-Choate equipment is defined as a straight mineral oil refined and dewaxed, minimum acidity, minimum foaming tendencies, and high resistance to oxidation. In general a good quality of motor oil of indicated SAE grade made from either asphaltic or paraffin base crude will be satisfactory.

Old Fordson Wheels as Tire Savers

Adapters supplied by the Airlite Manufacturing Co., Emporium, Pa., were used in the conversion of old Fordson wheels to fit the new rubber-tired Ford tractor, shown in the illustration. The old spokes are removed with an acetylene cutting torch; after which, the adapters are electric welded into place. This provides a good solid wheel that is interchangeable with the rubber tire and rim. In order to mount the converted wheel alongside the rubber tires (as shown in illustration) an extra wheel disc or an Airlite wheel mount is needed.

Converted Fordson wheel on tractor

Snap Gauge Life Increased

War Production Drive Headquarters offers this one, which was submitted to it by a shop worker.

Method of repairing snap gauges. By welding the snap gauges with stellite first on one side and then weld on the other side.

Result: This gives stellite tips on both sides and greatly increases their length of service.

23,300,000 Participants in Payroll Savings Plan

Nearly 2 million more workers in October pledged part of their earnings for the purchase of War Savings Bonds, bringing the total number of participants in payroll savings plans up to 23,300,000.

BRAKE LINING -- CLUTCH FACINGS -- SWINGING FRICTIONS -

Better Materials to Lick TOUGH Jobs, on Hoists, Shovels, Cranes, Dredges, High Lines, Tractors, Trucks and other equipment.

Whatever your service, we have the materials to do the job and will guarantee results. Send dimensions and tell us what you want.

GATKE CORPORATION, 230 N. LaSalle St., Chicago

How To Make Your Batteries Last Longer

Again, we quote from Barber-Greene Company's instructions on a subject of universal importance today: battery care.

The storage battery requires frequent and systematic attention. Its neglect is costly. In general, follow the instructions from the battery manufacturer for best results.

Inspection and Care of Storage Battery

Inspect the battery every 100 operating hours. Do not allow the surface of the electrolyte to get below the top of the separators. Keep it above by regularly adding sufficient clean distilled water as often as is necessary. Do not fill higher than just below the bottom of the filling tube. Never add acid to the battery.

Keep terminals tight and clean. If they show tendency to corrode, clean and apply a thin coat of vaseline to protect them from the acid. Keep the outside of the batteries clean. Neutralize any electrolyte that may be on the metal surfaces with a cloth saturated with ammonia or bicarbonate of soda solution (one pound of soda to one gallon of water), then wash off with water and dry.

At least once a month test the specific gravity of each cell with a hydrometer. A reading of 1.250 to 1.285 indicates fully charged, 1.230 half charged, and 1.150 dead. Never take a reading shortly after adding water. CAUTION: Do not allow battery to stand in the discharged state. It may become ruined by sulphation.

If the battery requires frequent addition of water and is gassing excessively have it tested. If in good condition, it is undoubtedly due to overcharging. Decrease the charging rate to avoid damage to the battery. If one or more cells continually require more water than others, it is an indication of a damaged cell which should be checked by the local battery service station.

Cold Weather Care

It is especially important in cold weather to test the specific gravity. A battery freezes between the temperatures 20 degrees above zero and 50 degrees below zero depending on the state of its charge. Do not add water after shutting down for the night. It will freeze quickly. See that it gets a charge after adding water.

Best Fed Fighters IN THE WORLD
To keep our fighters "the best fed", our armed forces use the most modern mechanized kitchen equipment available. Here again Briggs & Stratton Motors are proving their value by furnishing dependable power for bread mixers, refrigerators, water supply, lighting plants and other gasoline-powered equipment.
Today, the entire facilities of the Briggs & Stratton Corp., are devoted to the war effort and approved civilian uses. Therefore, Briggs & Stratton, 4-cycle air-cooled motors, now in essential service, should be given every care to assure uninterrupted performance.
Most important in maintenance is the use of clean fuel, correct lubrication with the right grade of oil, changed at recommended intervals, and motor kept clean and properly adjusted. In any case of emergency, your dealer or nearest Briggs & Stratton Service Station will be glad to be of assistance.
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MILWAUKEE, WISCONSIN, U. S. A.
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GASOLINE MOTORS

Oil Pressure Drop

The following is from a monograph, "The Need, Selection and Service of Modern Lubrating Oil Filters" by W. G. Burhans, President of W. G. B. Oil Clarifier, Inc.:

It is only in rare cases that even an old and worn engine will show an oil pressure drop of more than two or three pounds (which is not excessive) when a filter is installed. The modern internal combustion engine has an oil pump which delivers from 50 to 100 percent more oil than the bearings can take; the excess is dumped directly back to the crankcase through the pressure regulating valve which is set to release at some standard pressure running as low as 25 or as high as 80 pounds per square inch. However, there are a few cases of pressure drop which warrant our consideration. When installing ,lters on worn engines, the bearing clearances may be so great and the pump capacity so seriously impaired that engine failure is not far off. The installation of the filter with a new path for oil may cause a serious pressure drop. If a drop of more than three pounds is observed on the oil pressure gauge, disconnect the inlet line to the filter and install a restriction fitting which has a smaller orifice than that built into the filter. If pressure does not rise, check to see that the hook-up is correct and if the source of trouble cannot be located, write to the service department of the filter company. Disconnect the filter; do not attempt to operate engine with low oil pressure as serious damage may result.

PREFORMANCE COUNTS

ROSS SNOW PLOWS with their "Sno-Flo" moldboards are outstanding because of their "preformance." Because they will move more snow with less power, and because they always come back from a finished job ready to go out on another.

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BUY WAR BONDS TODAY

Snow Plowing Economies

A Truck Manufacturer's Suggestions for Saving Strain, Wear and Damage While Getting More Service from Equipment

The following comments and recommendations are from a recent issue of *FWD Truck News*, published by The Four Wheel Drive Auto Co., of Clintonville, Wisc.

Tandem Plowing

It is agreed that highway work, especially snow removal, ranks close to the top among the really strenuous tasks which are assigned to trucks. Operating in sub-zero temperatures, bucking drifts hour after hour, play havoc with even the finest engineered truck. "Drift bucking" which subjects trucks to such grueling and destructive punishment, must be stopped if real truck conservation is to be realized. Where heavy snowfall in the past made "drift bucking" necessary, the new order would be to use two trucks in tandem. Tandem plowing does the job faster with a proportionate lessening of impacts which cause stress and strain on vital working parts. Also, tandem plowing offers the advantage of accomplishing a more thorough job—pushes the snow farther off the highway, opens more miles of road per day—and does the job easier from the standpoint of both men and equipment.

Tire Conservation

Tires, too, can be conserved by observing a few fundamental rules before trucks are sent out to clear the highways. Snow removal truck operators are universally agreed that single tires are best for efficient snow removal. The use of single tires of the same size on all four wheels not only conserves rubber but also relieves excessive differential action in the driving mechanism thus prolonging the life of the truck. Emergency tire chains should not be used. Instead, closely spaced tire chains on all four wheels will give maximum traction with minimum slippage and less damage to tire equipment.

Care of Engine

Proper care of the engine is also important in your truck conservation plan. Change oil as often as required, keeping in mind that it's not total mileage that should be the determining factor, but rather, total hours of operation. Keep cooling system clean, free from rust and foreign deposits by using rain water or water with a low alkali content, plus a water softener. Control engine temperature by using a radiator hood or by having an automatic shutter installed.

Warm Housing Important

Care of the truck after the day's work is probably the most important phase of truck conservation. Housing the truck in warm quarters, during and after thorough servicing, keeps lubricants from becoming too solid to do their work properly, also, it is a known fact that steels become brittle at sub-zero temperatures. While modern metallurgy has produced steels of high tensile strength and resistance, failures caused by sub-zero fatigue is a condition that must be guarded against.

Weight Distribution

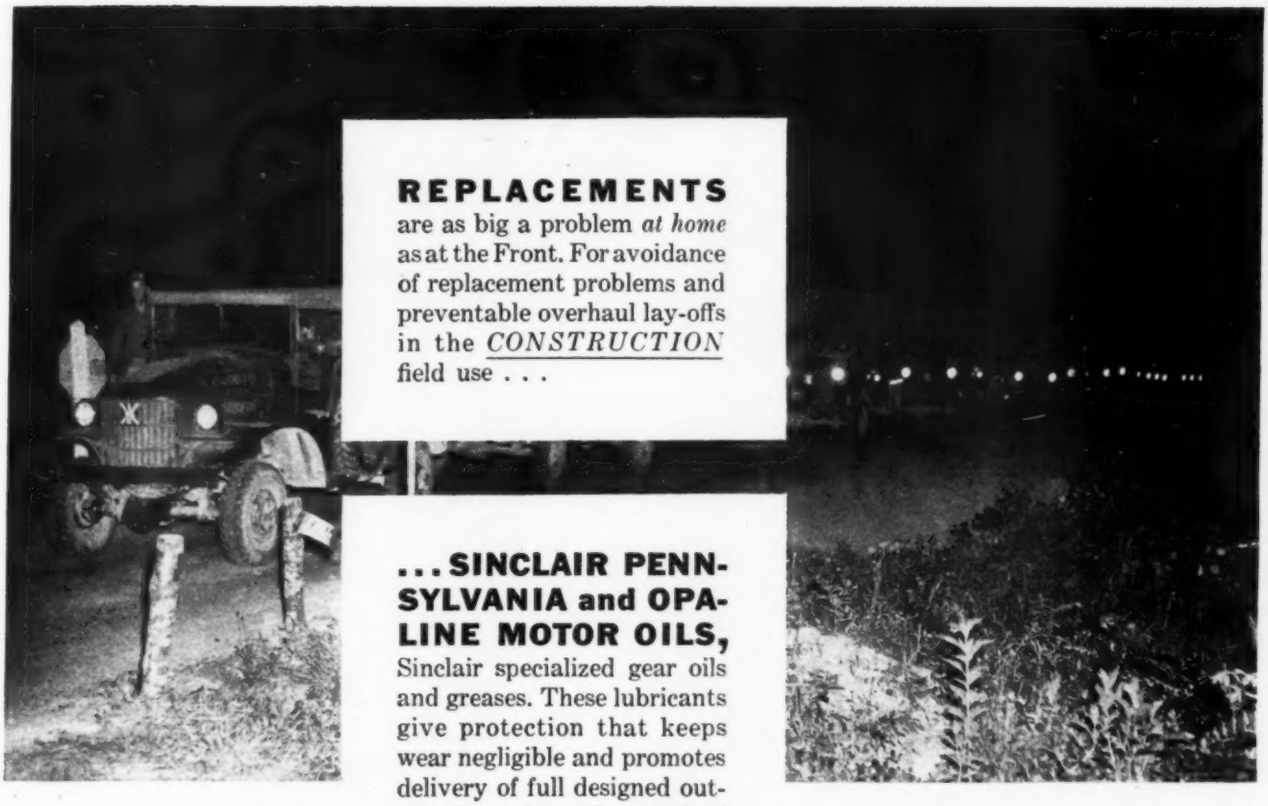
Proper weight distribution is a much maligned factor. A good rule would be to allow proportional weight on each axle not counting the weight of the plow. In making this statement we realize that some may argue differently. But the collective experience of thousands of FWD truck drivers indicates this to be the most practicable rule.

Truck Marking Simplified

Savings of material and labor are indicated in this suggestion which was made to the War Production Drive Headquarters.

The standard method of marking the weight, carrying capacity, destination, etc., of a truck was by stenciling this necessary information on a wooden board and wiring the board to the under side of the truck cargo body. New Method: This information be stenciled directly upon the body of the truck, thus doing away entirely with the use of boards and need of wiring them to the body.

Result: Brought about a saving of 36,000 square feet of lumber and 484 work hours in the sixty-day period.



REPLACEMENTS are as big a problem *at home* as at the Front. For avoidance of replacement problems and preventable overhaul lay-offs in the *CONSTRUCTION* field use . . .

. . . SINCLAIR PENNSYLVANIA and OPALINE MOTOR OILS, Sinclair specialized gear oils and greases. These lubricants give protection that keeps wear negligible and promotes delivery of full designed output from heavily worked equipment.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

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"Up periscope!" The skipper peers through the eye-piece . . . suddenly tenses. "Enemy cruiser bearing zero seven five relative . . . Stand by!" Quietly he gives the order: "Fire one! . . . Fire two! . . . Fire three!"

On both fronts—war and civilian—it's the "know-how" that counts.

Raybestos knows how. For 37 years Raybestos has pioneered in the production of friction materials for every purpose. That's why there is a Raybestos brake lining and friction *specially engineered* to meet the *exact* requirements of every make and model of machine that you operate!

Specify Raybestos for correct and dependable friction materials, and fastest deliveries.

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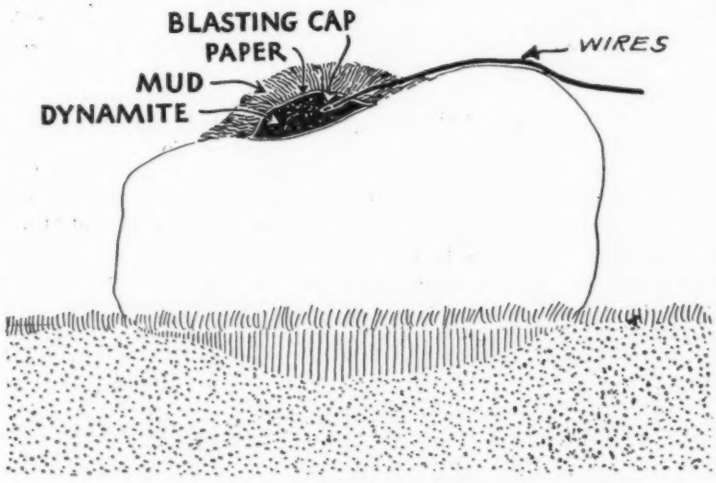
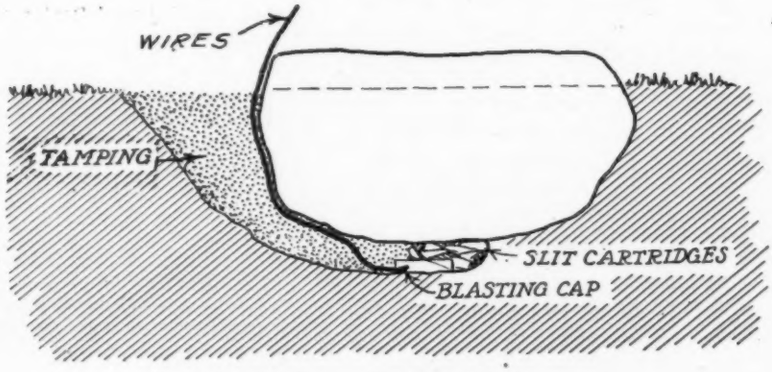
FOR SHOVELS • CRANES • HOISTS • TRACTORS & EARTH MOVERS

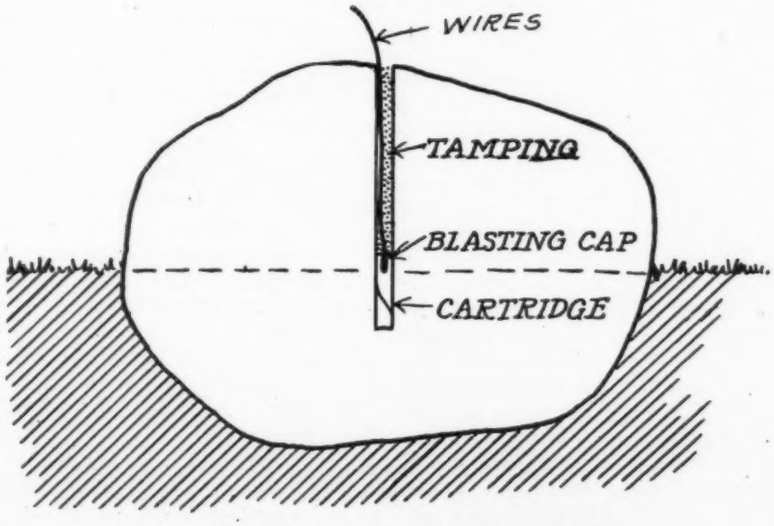
EXPLOSIVES *(Continued from page 44)*



Cross section of a mudcapped load



Locating a snakehole charge



Locating a blockhole charge

Sounding rod for examining the size of buried boulders

FIG. 801.—MUDCAPPING, SNAKEHOLING, AND BLOCKHOLING

TABLE 802. SUGGESTED CHARGES FOR BOULDER BLASTING[1]

Thickness of boulder opposite charge	Quantity of explosive[2]		
	Mudcap method	Snakehole method	Blockhole method
Feet	Cartridges	Cartridges	Cartridges
1½	1-2	1	¼
2	2-3	1½-2	¼
3	4-5	3 -4	½
4	6-8	5 -7	1

[1] See figures 800 and 801 for methods of blockholing, snakeholing, and mudcapping.
[2] These figures are based on 40 percent straight nitroglycerin dynamite, 1¼- by 8-inch sticks. See 801 A, Strength.

and B, classes 7 and 2b) is best for seam shooting as it runs into the small crevices easily, and does very effective work when confined with good stemming. See 805, Loading. However, do not use a free-flowing explosive for wet work as it takes up moisture readily.

If compressed air is available, and the seams can be cleaned with a blowpipe, a loading pipe will be found very efficient for loading free-flowing explosives. The air should be turned on gently with only sufficient force to blow the explosive back into the small recesses. Too much force may blow the explosive out of the hole.

d. Shales and hardpans. For most shales, hardpans, and partly disintegrated rocks, a low-strength slow explosive is usually the most economical to use. Type A, class 7 and type B, class 2b, Forest Service Acceptable List, are recommended. These explosives should be primed with a high-strength primer of type A, class 4 or type B, class 1a, etc.

C. Blasting Boulders

a. Amount of explosives required. The amount of explosives required for blasting boulders varies with the method used. Snakeholing is one of the easiest methods of removing boulders. Blockholing requires the least, and mudcapping requires the most, explosive of the three common methods.

Blockholing or plugholing requires much expensive drilling, but not as much explosive as mudcapping. It is more economical to move the rock with tractor equipment where material is not of an excessive size.

See table 802 for suggested charges four boulder blasting.

b. Blockholing. Blockholing consists of drilling a hole into the boulder and charging it with a small amount of dynamite. It is the best method for breaking very hard or very large boulders, especially those of the "nigger-head" type that are difficult to break by other methods. The hole should usually be drilled about halfway through the boulder and may be an inch or larger in diameter.

The explosive is sometimes removed from the shell and packed firmly into the bottom of the hole. Tamping the hole helps the explosive to give the best breakage. Good confinement is required to obtain the best results. Any of the lower grade dynamites will give good results when loaded and stemmed properly.

Blockholing is very effective in blasting outcropping ledges where the top of the ledge only needs to be removed. See figures 800 and 801.

c. Snakeholing. Snakeholing consists of digging a hole under and immediately against the bottom of a boulder, and placing the charge of explosives in as compact a shape as the size of the hole will permit. The explosive, being confined on the underside by the earth, can exert a powerful blow on the boulder and will roll it out. If a sufficient charge is used, the boulder will be broken into fragments. This is one of the easiest and most successful methods of boulder blastings. See figures 800 and 801.

d. Mudcapping. Mudcapping is known by a variety of names, such as "bulldozing," "blistering," "poulticing," "plastering," and "dobying." It is made possible by the fast shattering action of the higher-strength explosives. One method of mudcapping consists of removing the explosive from the shell, packing it in a compact conical heap on the boulder, and, after inserting a primer, covering it with the wrappers and several inches of thick heavy mud. Where there is a great of work to be done, the exposive is not removed from the wrapper, but whole or half cartridges, sometimes slit, are arranged as compactly as possible at a given point on the boulder. The cap is inserted in the end of one of the cartridges and the whole charge covered with mud.

The explosive should be placed on the boulder at the place where the rock would be struck with a hammer, were it possible to break it in that way. This may be on the top or on the side. If the boulder is embedded in the ground, a snakehole shot to roll it out on the surface should first be made because the confining dirt makes it much harder to break with a mudcap shot. The mud covering should be as thick as is convenient to make it, but not less than 5 or 6 inches, and free from stones. The blast will throw stones as though they were bullets. Never lay a stone on top of the mud for the same reason. See figure 801.

D. Blasting Clay and Soil

In dry, tough, clayey soils the material should be loosened to facilitate economical moving. In these cases a slow propulsive explosive should be used. Type A-7 and type B-2b are the explosives on the Acceptable List recommended for this type of blasting.

(To be continued)

Technically Trained Personnel Needed

Following recent increases in demand for technically-trained personnel, the National Roster of Scientific and Specialized Personnel has urged senior and graduate students of chemistry, physics, engineering, and other specialized fields to register their skills. The principal national professional and scientific societies are constantly cooperating with the National Roster to stimulate complete registration in their respective fields.

Names on file include scientists of such international fame as Albert Einstein, physicist; James Bryant Conant, president of Harvard University; Karl P. Compton, Radio Corporation of America; Igor Ivan Sikorsky, aeronautical engineer; Charles Franklin Kettering, head of National Inventors Council. It also includes the most recent college graduates in various scientific courses. Constant efforts, moreover, are made to list all people with technical training, even though their skills may not have been used in recent years.

Registration with the Roster is not to be considered application for employment. Many who have filled out the questionaires are now at work in their chosen professions. Many of those registered have received offers of employment. Acceptance of such offers is optional with each individual registrant.

To register with the Roster, a man or woman with scientific or other specialized training should write to Dr. Leonard Carmichael, Director, National Roster of Scientific and Specialized Personnel, War Manpower Commission, Washington, D. C., mentioning the field or fields in which he or she has training or knowledge.

The Axis started this war of machines... but Uncle Sam's Army is coming up fast with the weapons to finish it! One of the newest and most effective is this giant Mack Army Prime Mover.

Made-to-Order

for the World's Toughest Customer...

The Army's newest and biggest prime mover is probably the best single job in truck history. Most of its details can't be made public... but you can see for yourself that it's *big.* And we can tell you that it hooks up to a whale of a big gun, takes on a terrific load and goes almost anywhere except straight up. We're proud of it, at Mack, and with good reason. Proud that the Army called on Mack men and facilities to develop and build it. Proud, as Americans, that our fighting men are getting fighting equipment so fine. And proud that this, too, is "built like a Mack truck"... with all that phrase has stood for in ruggedness and reliability for forty-two years!

Mack Trucks, Inc., New York, N. Y. Factory branches and dealers in all principal cities for service and parts.

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FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

BUY U. S. WAR BONDS

IF YOU'VE GOT A MACK, YOU'RE LUCKY... IF YOU PLAN TO GET ONE, YOU'RE WISE!

Editorial

Act Now On Scrap Collection

MANY road builders have helped the scrap drive with the worthy feeling that they are getting behind the war effort. But the stake is far more personal than that. Every contractor and every highway department man knows some boy who is at the front fighting—in Algiers, the Solomons, no matter where. Whether that boy comes safely back to your home, your neighborhood or your outfit someday depends largely on *whether he has fighting equipment.*

And that in turn is up to you. It is something you can "do something" about, because fighting equipment requires scrap to manufacture, and the road field is still a rich untouched lode of scrap metal.

"Your industry has the very best kind of heavy melting scrap for munitions," writes Harvey T. Hill, the War Production Board's regional industrial salvage chief at Chicago, who further adds: "But I'm sorry to say that roadbuilders and construction men have lagged behind other industrial groups in meeting scrap quotas. A bigger effort from road men will be especially helpful this winter."

Steel making requires a definite ratio of scrap metal to pig iron. Largely because of a scrap shortage the steel industry fell 5 million tons under its 1942 goal of 90 million tons —a lag equivalent to half the entire yearly steel production capacity of Japan! Steel's importance in this war, lest we forget, is graphically shown by the fact that 4900 pounds of it is needed per fighting man in this war, compared to only 93 pounds in World War I—a fifty-fold increase.

The acute shortage of last summer has been relieved for the time being, it is true, furnaces running practically at 100% in recent months with no shut-downs for lack of scrap since Labor day. But trouble again looms. While a large stock-pile of scrap has been accumulated, we are headed into the cold winter months when industrial scrap movement slows down. Unless big new scrap sources are tapped immediately the furnaces will be licking their chops and war production seriously threatened by spring.

What can roadbuilders do? Mr. Hill has several practical suggestions. "First, those in authority must get tough and make some decisions. Only the man in authority can turn in those old rust covered, obsolete rollers, scrapers, dump wagons, and other machines moldering in equipment yards. The first need is for the boss to act.

"Second, make a list of stuff you can kiss goodbye. If a machine hasn't been used for a season, seriously question your further need of it. If a wornout truck or other unit is being held as a source of replacement parts for other machines, tear it down, save the crankshafts and other commonly needed parts and turn in the rest.

"Third, while cast iron and soft steel are still needed, make a special effort to contribute heavy melting or high alloy steel."

This is an opportunity for the highway industry to give the war effort a big lift. Many highway shops and contractor repair shops are *buying* scrap to repair or manufacture parts that can't be replaced. That important work must continue to keep essential equipment rolling. But the big call is to *sell* or *give* scrap.

Get in touch with your local Industrial Salvage Committee or see your scrap broker about cleaning out your collection of junk and old "museum-piece" machinery.

Do something, now.

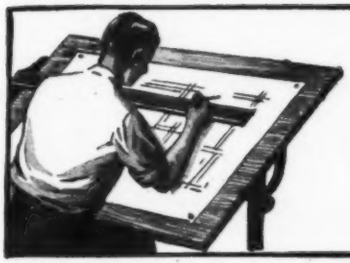
In January: Alcan Highway

FEW highway projects of our time have caught the public fancy more completely than the Canada-Alaska Military Highway. Its strategic importance combined with popular articles on its spectacularly fast construction in a colorful north-woods setting, has served to make "Alcan" almost a household word.

Alcan Highway is also a great engineering accomplishment. Beginning with the preliminary task of organizing army and civilian forces and supply-lining trainloads of equipment and rations—and on through the phases of reconnaissance and surveying, clearing and grading, follow-up improvement, bridging, maintenance and equipment care—the project is marked by war-inspired speed and resourcefulness. How they did it will make an absorbing story. How its builders are staying on the job through the rigorous sub-arctic winter to fight snow and ice and keep freight tonnage flowing, is also a chapter which roadbuilders await reading with keen interest.

Hence it is with considerable pride that the publishers of ROADS AND STREETS announce publication in January of a detailed review of Alcan Highway. January is a particularly fitting month in which to publish the year's biggest highway project. We have always considered our January number the most important of the year, and every effort is being employed to make next month's issue a document you'll want to read carefully and file as a permanent reference. Our Associate Editor, Harold J. McKeever, is busy putting the finishing touches on a remarkably thorough series of illustrated articles.

The story of Alcan was not an easy one to piece together. Methods often varied from mile to mile, due to changing forest and ground conditions, difference in available equipment, or as a natural result of decentralized management. On a far-flung job where there literally was no time for blueprints, a premium was put on resourcefulness and initiative in the field. No one man or ten men knew the whole story except in broad outlines. Only by spending many days in the isolated work camps along the way and talking with scores of men from grease monkeys to colonels could McKeever glimpse the day-by-day methods and kinks that made a 1600-mile road by December finally possible.



"ONE OF THE MOST USEFUL PIECES OF WORK THAT I HAVE RECEIVED IN 20 YEARS"..

WRITES ONE ARCHITECT

FREE
TO ARCHITECTS AND ENGINEERS

The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood.

AND HERE'S WHAT SOME OTHERS SAY:

"An excellent reference book at a most appropriate time. Thank you!"

"Many thanks. Best thing I've seen. Much appreciated."

"These designs are a great time saver to the architect."

"A very commendable job in bringing data to the architect, of high practical value."

In TYPICAL DESIGNS OF TIMBER STRUCTURES we have grouped the plans of 45 representative types of timber structure that have been *engineered* by the TECO System of Construction. A request on your professional letterhead will bring you a copy of this valuable reference book.

Timber ENGINEERING COMPANY

WASHINGTON, D. C. PORTLAND, OREGON

The Borrow Pit

¶ The colored preacher had just finished his sermon about free salvation and asked a brother to take up the collection. At this, a member of the congregation rose and protested: "Pahson, Ah thought you said salvation was free—free as the water we-uns drink."

"Salvation is free, Brother," replied the parson. "It's free and water is free, but when we pipes it to you —you have to pay for the piping."

• •

¶ Son: "Mom, I have a girl now that has everything."

Mother: "What do you mean, everything?"

Son: "Well, she owns a typewriter, she has a full set of new tires and her old man runs a gas filling station."

—Dixie Contractor

• •

¶ A drunk, watching a revolving door saw a man walk in. Soon the revolving door revealed a pretty girl stepping out.

"It's a good trick," said the drunk, "But I still don't shee what that guy did with hish clothes."

—Excavating Engineer

• •

¶ And then there's the story of the two Japanese statesmen who jumped out of a hotel window because they found an American vessel under the bed.

—California Engineer

• •

¶ Wife: "The new maid has burned the bacon and eggs, darling. Would you be satisfied with a couple of kisses for breakfast?"

Husband: "Sure—bring her in."—*The Yellow Strand.*

• •

¶ She: A bachelor is one who has been crossed in love.

He: A married man is one who has been double-crossed.

—Dixie Contractor

• •

¶ And then there was the student who wrote: "Virgin wool comes from the sheep that can run the fastest."

¶ JUST YANKS

I'm no hero, neither are you,
I'm an American! You are too!
So wield that torch and man the ratchet,
And when we're through the Japs will catch it!
I'm no hero . . . neither are you . . .
We're just Yanks with a job to do!

—Paul K. McAfee, Experimental. Marmon-Herrington News

• •

ON THE ALCAN HIGHWAY SURVEYS

• •

¶ DUMB ANIMALS!

A lecturer was talking in a certain hall one evening on the drink question. "Now, supposing I had a pail of water and a pail of beer on this platform and then brought on a donkey; which of the two would he take?"

"He'd take the water," came a voice from the gallery.

"And why would he take the water?" asked the lecturer.

"Because he's an ass," came the reply.

• •

¶ HITCHHIKER'S REVENGE

Blessings on you, luckless man,
With your tireless new sedan,
It's too late to groan or cuss,
Now you, too, may thumb with us.

—Lee W. Pratt.

¶ A mule dealer insured all of his help against accident. Later, a mule kicked one of the helpers and broke his leg.

Some time afterwards the employee was asked if he got his accident insurance. He replied, "Why, No! That was no accident. The mule kicked me on purpose."—*The Yellow Strand.*

• •

¶ "Hey, John!" called out the service station attendant, "Your doctor is out here with a flat tire!"

"Indeed! A most interesting subject!" came the voice of the boss from the rear of the building. "Diagnose the case as flatulency of the perimeter and charge him accordingly!"

• •

¶ Warden: "So you think you are sane now. If we give you your liberty, will you leave liquor and women alone?"

Inmate: "I sure will."

Warden: "You'd better stay here. You're still crazy."

• •

¶ "I suppose you're still angry because I came home late last night with this black eye."

"Maybe you've forgotten, but when you came home you didn't have that black eye."

—Yellow Strand

• •

¶ A wife in South Carolina wrote to the local draft board.

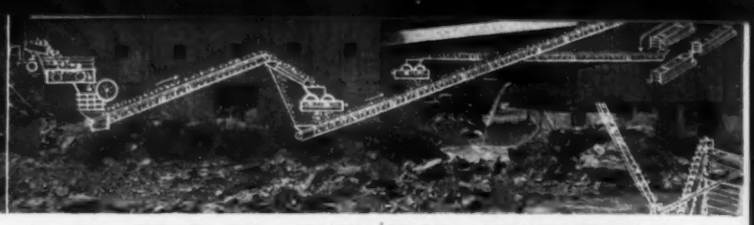
"Please take my husband into the service," she said. "He wants to fight all the time, and I am not able to."—*Boston Globe*

• •

¶ Shortage of men has forced Benton Harbor, Mich., taxi company to hire women drivers. The back-seat driver moves up front.—*Mississippi Highways*

• •

¶ One thing a woman cannot be criticized for: She never wastes $2.00 worth of shotgun shells in order to get a 25c rabbit. [She prefers mink.—Ed.]



Rock Plants AS YOU LIKE THEM •

No two rock jobs are alike. They vary in material — in the size of the feed — and the size and number of sizes in the product. Some rock must be washed — some rock is hard and brittle — others are tough — and some is soft.

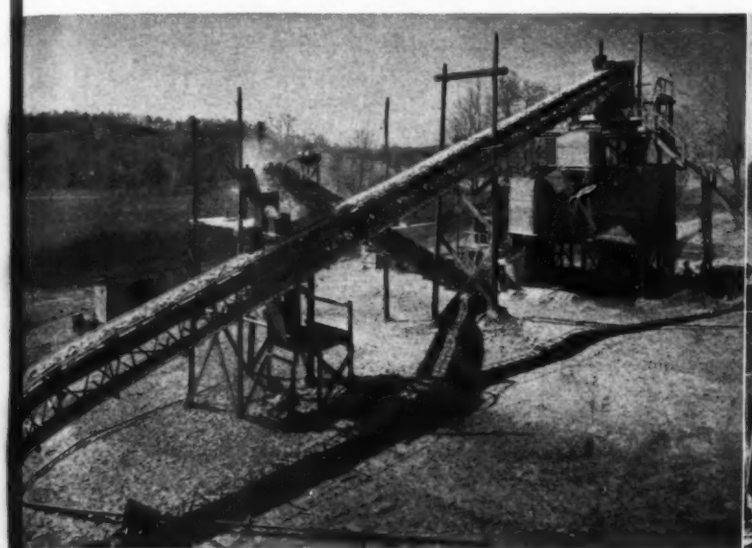
In one case, screening is the big problem — and in others it is crushing.

For *your* rock job, you want a plant that is tailored to your problem.

That is where Pioneer can help you. Pioneer Rock Plants are tailor made to suit the particular requirements of the job. Standard Pioneer Units are used — jaw crushers — roll crushers — screens — conveyors — elevators — and bins.

Tell us your rock problem. We will make a preliminary layout of a plant to suit your conditions. It will be submitted to you for revision and consideration. After approval, we will make finished installation and foundation drawings.

Furthermore, a Pioneer Rock Plant is complete with power, drives, and all accessories. It is fully engineered and factory built — yet tailored to your job — and there is no cost for this Pioneer Engineering Service.



Pioneer

ENGINEERING WORKS

Minneapolis, Minnesota, U.S.A.

About Contractors and Their Jobs

Kansas City Area

REPORTED BY

PAUL L. MATCHETTE

One of the last non-military highway projects in Missouri was completed and opened to traffic in November. It is a 10-mile strip of paving on U. S. Highway No. 24, near Huntsville, Mo. Carl W. Brown, Chief Engineer of the Missouri Highway Department, attended the completion ceremony. Highway No. 24 crosses the State of Missouri in nearly a straight line from Hannibal, Mo., on the Mississippi River to Kansas City, Mo., on the Missouri-Kansas state line.

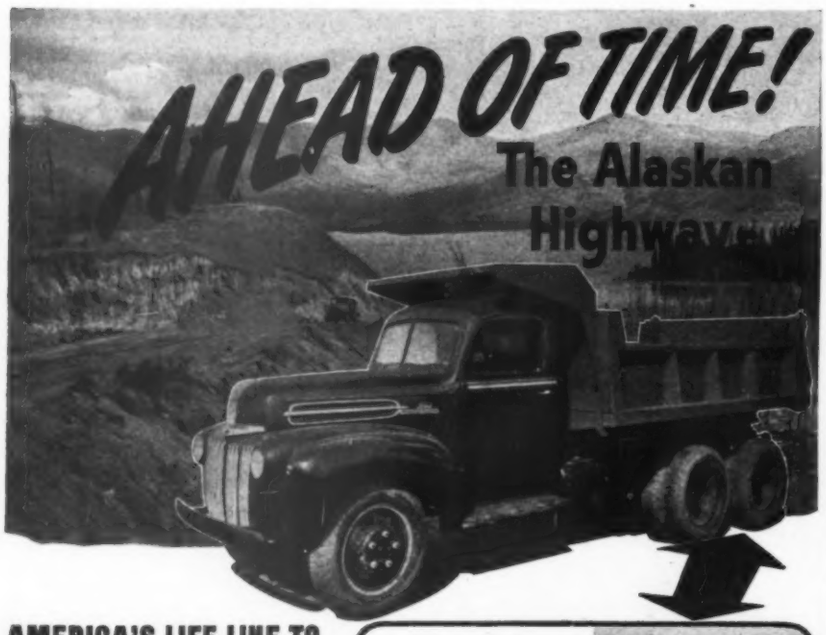
The Rock Island and Milwaukee Railroads are building a $1,250,000 bridge across the Missouri River at the northeast corner of Kansas City. The Massman Construction Co., New York Life Building, Kansas City, Mo., are now completing the pouring of the concrete piers.

Howard, Needles, Tammen and Bergendorff, Consulting Engineers of Kansas City, are about ready to ask for bids on the super structure, which will be one-half mile long. Completion of this job depends on when steel is available. It has the approval of the WPB.

C. H. Atkinson Paving Co., of Chillicothe and St. Joseph, Mo., and Taylor and McCoy, of Salina and Emporia, Kans., have recently completed one of the largest and fastest concrete airport runway jobs up to date. The finished concrete runways included 1,700,000 sq. yds., equal to approximately 176 miles of 20 ft. slab or 348 acres of paving. Working 20 hours per day, the biggest day's pour and finish was 41,096 sq. yds. Two hundred thirty-eight batch trucks were used and hauled 15,473 barrels of cement, 6,301 tons of sand and 8,092 tons of rock. The C. H. Atkinson Paving Co. is owned by Ed H. Atkinson, St. Joseph, Mo., and Murray N. Windle, Chillicothe, Mo. Taylor and McCoy is Harry J. Taylor, of Salina, Kans., and Curt J. McCoy, of Emporia, Kans. All of these men are veterans in the paving game. They are to be congratulated on doing a wonderful job.

The Missouri State Highway Department is one of seven states to make the first start on engineering work for post-war highway construction. Under the Defense Highway Act of 1941, Missouri will receive about $300,000 which will be matched with an equal amount of state funds. This will make available $600,000 for getting important jobs ready for letting.

Recently, the University of Kansas, Lawrence, Kans., issued a pamphlet of 100 pages, entitled "Kansas Mineral

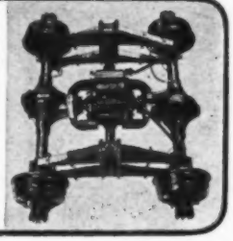


AMERICA'S LIFE LINE TO THE NORTH IS OPEN!—

Operating months ahead of even the stiff schedule set up by Army engineers!

A tough assignment in rough country calling for husky, durable, efficient equipment — and right on the job is a big fleet of trucks with

Put TWO driving axles under the load instead of one, double the gear speeds, improve springing and load flotation, gain vastly superior tractive ability.



THORNTON FOUR - REAR - WHEEL DRIVE

By means of **THORNTON** installations these trucks have been converted from 1½ to 2-ton vehicles into heavy-duty, four-rear-wheel drive trucks handling 6-yard dump bodies.

Standard heavy-duty trucks are not available today—but here is the answer to that problem. You can convert new or used 1½ to 3-ton trucks to husky, reliable heavy-duty units of more than twice the capacity. They actually do the job better and cost less.

While Uncle Sam still approves, act quickly! Contact your nearest Truckstell-**THORNTON** dealer or wire the factory direct. Trained men will engineer this equipment to suit **YOUR OWN PARTICULAR JOB.**

THORNTON TANDEM CO.

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Manufacturers also of the THORNTON automatic-locking DIFFERENTIAL

"When you need TRACTION you need THORNTON"

Resources for Wartime Industries." It gives in detail the tremendous reserves of many essential war materials or raw materials from which essential war products can be made. The book was prepared by John M. Jewett and W. H. Schoewe, of the Geological Survey of Kansas, with special sections prepared by R. M. Dreyer, John C. Frye, R. P. Kercher, E. D. Kinney, Norman Plummer and John F. Romary, staff members of the Survey.

The book sets forth the estimate of 752,670,000 barrels of crude petroleum reserve. Last year, Kansas produced 85 million barrels of oil and 85½ billion cubic feet of natural gas. It discloses that oil field brines contain larger quantities of magnesium than does sea water. Kansas has large deposits of clay from which aluminum can be obtained. At present, 60,000 tons of zinc and 15,000 tons of lead is being produced each year.

In non-metalic minerals, the state has in reserve over 50 billion tons of chalk, 125 billion tons of clay, 40 billion tons of light firing clays and over 5,000 billion tons of salt. The state at present is producing 700,000 tons of salt annually. Asphalt rock, bentonite, diatomaceous marl, gypsum, rock wool materials, fillers for plastics, sand, gravel, stone and volcanic ash are all found in large quantities. The pamphlet contains many maps. It is well done and is a credit to the men who prepared it.

Apple, White and Russell Construction Co., of Oklahoma City, have the contract for grading the roads and streets at the air force training school in Oklahoma. The grading and drainage of the runways are being done by Groves, Lundeen and Cox, of Minneapolis, Minn. M. W. Watson, Topeka, Kan., and R. C. Dohe, Metropolitan Paving Co., Tahlequah, Okla., are laying the hot asphalt surface. H. J. Hall Construction Co., Kansas City, Mo., has the contract for grading and paving an army airfield near Gage, Okla. Jaicks Brothers Construction Co., Chicago, Ill., are laying the hot asphalt surface.

Russ Mitchell, Inc., Houston, Texas, has the grading, paving and taxiways on an airport at Ardmore, Okla. This is an air force training school.

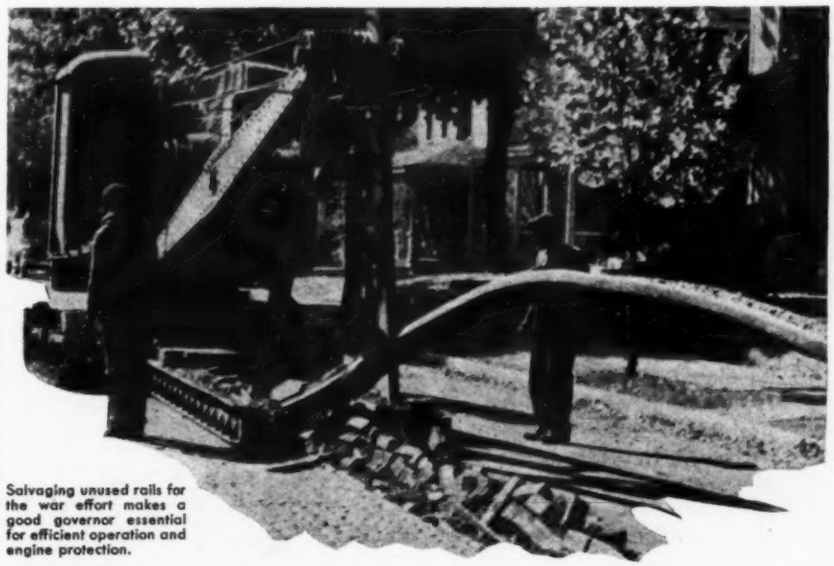
$858,028 Price Fixed for Missouri Bridge

The State Highway Commission of Missouri, on December first, fixed $858,028 as a fair price to pay Kansas City and Clay County for the A-S-B bridge over the Missouri River in Kansas City which the state acquired.

The commission offered to pay $358,028 as soon as the city and county accept the figure, but decided to defer action on the remaining $500,000 "until at least three months experience with gasoline rationing's effects on highway revenue," said George Davis, commission chairman.

War Production Board Stops 2 Projects

The War Production Board on Nov. 27 revoked priorities and ordered immediate stoppage of all work on two projects of the Connecticut State Highway Department—New London-Groton bridge and approaches, and Hartford-Eastern bridge and approaches. These stoppage orders were issued in conformity with the policy announced in October of drastically curtailing construction programs in order to make materials available for direct military use for such essential programs as that of rubber, high-octane gasoline, aviation, aluminum and alloy steel expansions.



Salvaging unused rails for the war effort makes a good governor essential for efficient operation and engine protection.

It's on a Tough Job like this, you need **PIERCE** *at the throttle!*

HOW TO MAKE YOUR GOVERNORS LAST!

Like others manufacturing for war needs, Pierce production is for war and essential industry. For this reason new governors can be supplied only on a priority basis. But Pierce calls attention to these easy measures which will make your present Pierce Governors last and give the best service.

- **CLEAN GOVERNORS** once a month with kerosene, gasoline, or prepared cleaner.
- **INSPECT AND CHECK GOVERNORS** each week when in continuous operation.
- **CHECK OIL LEVEL** every day in manually lubricated governors. SAE 20 is recommended at this time of year.
- **LINE UP** driving pulleys or gears accurately when reassembling governor after cleaning.

Should your governor need repair or reconditioning send it to the factory with the necessary preference rating certificate.

● Ripping up rails, imbedded for years in hard brick pavement, requires a lot of power all at once—and then, almost immediately, no power at all as the rail jerks free! It takes an accurate governor at the throttle, sensitive to every change in load, to provide exactly the amount of power that's needed automatically and instantaneously . . . and to shut it off in a split second to protect the motor against destructive over-speed!

That's why Pierce Flyball Governors have been so widely adopted as standard equipment! They not only give highly sensitive control of engine speed for efficient operation of equipment and protection of engines, but they bring you rugged, precision construction that assures long, dependable service under the toughest conditions.

THE PIERCE GOVERNOR CO., 1657 Ohio Avenue, Anderson, Indiana

NOW... and after the war... *insist* on Pierce Flyball Governors when you purchase new equipment.

Pierce Governors

STANDARD SINCE 1913

Personal Items about Engineers

Brig. Gen. Warren T. Hannum is now division engineer of the newly formed Pacific division of the U. S. Army engineer corps, with headquarters in Salt Lake City. The Pacific division combines the former North Pacific, South Pacific and Mountain divisions.

Andrew K. Richardson, city engineer of Helena, Montana, since 1940, is in Tuscon, Arizona, in the naval officers' training school.

Col. Richard Park is now district engineer for the U. S. Army in Seattle, Washington.

Col. Peter P. Goerz, who has been relieved by Col. Park as engineer for the Seattle district, has been made executive officer of the engineer board of Ft. Belvoir, where he will supervise the development of engineer equipment, experimental work in camouflage, and numerous special studies in connection with the equipment used by the U. S. army engineer troops.

B. E. Clark, heretofore Maintenance Engineer of the State Highway Commission of Oklahoma, has been appointed Chief Engineer to succeed Van T. Moon, who died on Dec. 4.

by "Special Delivery"
We're moving fast these days, building cantonments, air bases, roads, plants, etc.—and it's important to do a good job in a hurry. The fast action of Hercules Speedraulic Hoists isn't something new, but it is something important when there is lots of material to be moved. With fast, powerful 6", 7", 8" and 10" Hercules Speedraulic Center Lift Hoists, it's "Special Delivery" of capacity loads, on time—every time.
HERCULES STEEL PRODUCTS CO.
GALION, OHIO

Nominees for Officers of American Road Builders Association

The following are the official nominations for officers for the year 1943 and for directors for three years of the American Road Builders Association, submitted by the Nominating Committee:

For President:

C. W. Brown—Chief Engineer, Missouri State Highway Department, Jefferson City, Mo.

For Vice-Presidents:

Paul B. Reinhold—President, Reinhold & Co., Inc., Pittsburgh, Pa.

Charles W. Smith — President, Smith Engineering & Construction Co., Pensacola, Fla.

Lion Gardiner — Vice-President, Jaeger Machine Company, Columbus, Ohio

Robert A. Allen—State Highway Engineer, Carson City, Nev.

For Treasurer:

H. C. Whitehurst — Director of Highways, District of Columbia, Washington, D. C.

For Directors, term ending 1946:

R. H. Baldock—State Highway Engineer, Salem, Ore.

Robert B. Brooks—Consulting Engineer, St. Louis, Mo.

J. F. Cast—Manufacturers' Sales Manager, Firestone Tire & Rubber Co., Akron, Ohio

Paul L. Griffiths — Vice-President, Koppers Co., Pittsburgh, Pa.

W. R. Macatee—Managing Director, The Asphalt Institute, New York, N. Y.

A. E. O'Brien—Secretary, Associated Pennsylvania Constructors, Harrisburg, Pa.

Nello L. Teer—Contractor, Durham,

CORONACH

"Of those immortal dead who live again
In minds made better by their presence."

FREDERICK SNARE, JR., secretary, treasurer and a director of the Frederick Snare Corporation, 114 Liberty Street, New York, contracting engineers, died Nov. 27. His home was at 90 Booth Ave., Englewood, N. J.

Mr. Snare was cited and decorated in the last war for bravery under heavy shell fire in the battles of Sel River, Jonc de Mer Ridge and St. Maurice River, between Oct. 16 and 20, 1918. The citation told of his "courage, skill and devotion to duty as battalion transport officer" in supplying hot rations to the companies of his battalion in the line and personally directing and supervising the evacuation of killed and wounded from forward areas." He was a lieutenant in the Twenty-seventh (New York) Division.

FRANK SEARS SENIOR, civil engineer, known especially for his railroad construction and pneumatic foundations, died Nov. 29 at his home, 82 Myrtle Avenue, Montclair, N. J., at the age of 66.

Mr. Senior received his C. E. degree from Cornell in 1896. From 1899 to 1929 he was with the Arthur McMullen Company, from 1909 as vice-president. In 1929 he formed Senior & Palmer, Inc., construction contractors, now at 50 Church Street, New York.

In the last war Mr. Senior served in France for eighteen months as a major, Transportation Corps, A. E. F., and was cited for "meritorious and conspicuous service."

CHARLES HUDSON BULL, who retired in 1928 as Brooklyn Borough engineer of the Department of Water Supply, Gas and Electricity, died Nov. 27 at his home, 1155 Park Avenue. His age was 83.

Mr. Bull was an assistant on surveying and engineering projects in Rochester from 1875 to 1878. On July 9, 1878, he entered the employ of the old New York Department of Public Works. He next served on water-main construction in Manhattan and Brooklyn and, from 1883 to 1895, was in charge of the repaving of streets in Manhattan. In 1890 Mr. Bull was sent by former Mayor Thomas F. Gilroy to Europe to study street pavement techniques. As a result of his report the City of New York began for the first time to pave residential thoroughfares with asphalt.

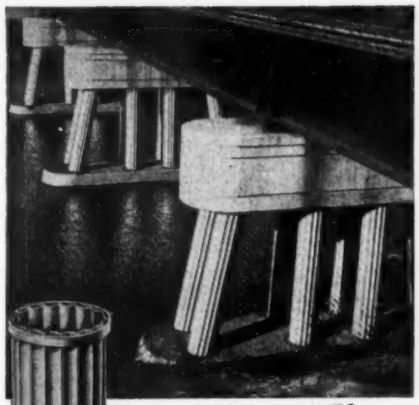
Mr. Bull was assigned to water supply work exclusively in 1895, was named personal assistant to the chief engineer in 1915 and four years later assumed the post he held at his retirement.

FRANK CALVIN ROBERTS, SR., civil engineer whose professional activities covered a broad range of design and construction in the United States, Canada, Great Britain and Spain, died Nov. 30 at his home in Wynnewood, Penna, His age was 81.

Mr. Roberts was the designer of many important buildings, including that of the Curtis Publishing Co. in Philadelphia. He also designed more than 75 iron and steel plants and supervised the construction of many railroad bridges.

CLAUDE I. GRIMM, civil engineer of Portland, Ore., died in that city on Dec. 1. Mr. Grimm was well known in engineering circles in the Northwest. In recent years he had been supervising engineer for design and construction of the Bonneville power and navigation project, as well as for other flood control works.

JOHN H. HALL died recently in Tucson, Ariz. He was a member of Musselman and Hall, Paving Contractors, Railway Exchange Building, Kansas City, Mo. Many of his friends will remember when he left Kansas City nine years ago bound for Tuscon. He was 61 at the time of his death.



TRESTLE OUT!
NEW BRIDGE IN!
with
EXTENDIBLE
MONOTUBES

On this D. T. & I. Railroad job engineers replaced an old timber trestle with a modern bridge, without interrupting traffic, by using Union Metal *Extendible* Monotubes for the installation of cast-in-place concrete piles. A panel was removed from the trestle to permit driving of the main lower tapered section of each Monotube. The panel was replaced as a train approached, removed again after its passage and the necessary Monotube extensions added.

Next time *you* have a piling problem, let Union Metal Monotubes supply the answer. Monotubes will speed the work, too, because of their *four* time-saving advantages . . .

1. **SPEEDY Handling.** Monotube steel casings are light in weight for fast, economical handling.
2. **SPEEDY Driving.** Tapered Monotubes require no core or mandrel and can be driven with any crawler crane equipped with standard leads and hammer.
3. **SPEEDY Extension.** Use of Extendible Monotubes permits installation of varying pile lengths on the job without delay or waste—permits quick installation even in low headroom.
4. **SPEEDY Inspection.** Hollow, tubular design enables you to inspect casing quickly and thoroughly from top to toe.

Monotubes can be supplied in a gauge, taper, and length to suit the requirements of any job. And our foundation engineers will work with you on request. Write for Catalog No. 68A!

Design Engineers: D. T. & I. Railroad
F. W. KASTEN, *Chief Engineer*
J. S. HANCOCK, *Bridge Engineer*
Contractor: C. R. BOULTON
Columbus, Ohio

THE UNION METAL
MANUFACTURING CO.
CANTON, OHIO

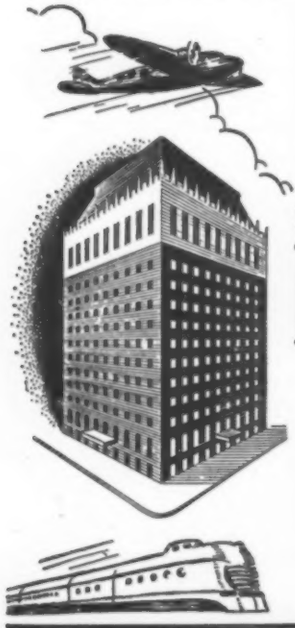
Frank J. Weschler, Vice-President of the Chain Belt Co. of Milwaukee, and General Manager of Baldwin-Duckworth, a division of Chain Belt Company at Springfield and Worcester, Mass., died suddenly on Nov. 10th in Worcester. Mr. Weschler has been exceedingly active in the industrial life of Springfield, Worcester and Massachusetts. Born in Erie, Pa., he moved east in 1902 to take a position with the cycle industry. In 1906 he became affiliated with the Hendee Manufacturing Co., now the Indian Motorcycle Co., as sales manager. In 1909 he became clerk of that corporation—treasurer in 1910—vice-president and general manager in 1922—and president in 1923. In 1927, Mr. Weschler became affiliated with the Baldwin Chain & Mfg. Co. of Worcester, Mass., as president and treasurer. Upon the merger of that company with the Duckworth Chain & Mfg. Co. in 1930, he became treasurer and general manager of the newly-formed Baldwin - Duckworth Chain Corporation. When Baldwin - Duckworth merged with the Chain Belt Co. in 1939, Mr. Weschler became vice-president of Chain Belt Co., and general manager of Baldwin-Duckworth, which is now a division of the Chain Belt Co. Mr. Weschler was an executive whose ability was recognized widely. He had been a vice-president of the Associated Industries of Massachusetts, a director of the Chamber of Commerce, and had been appointed to directorship in a number of banks.

John J. Klein, assistant secretary of The Marmon-Herrington Co., died Nov. 12 from pneumonia. Mr. Klein was born in New York City on June 21, 1910. He graduated from the Fordham Preparatory School in 1928; from the Stevens Institute of Technology, Hoboken, N. J., in 1932, and from the Fordham University School of Law, New York City, in 1935. He was a member of Delta Tau Delta Fraternity. Mr. Klein's education and experience represented that rare combination of legal and engineering training which brings so much to American industry. Prior to coming with the Marmon-Herrington Co. he was a member of the legal firm of Klein, Kinsey & Klein of New York City, and was admitted to practice before the bar in the State of New York, the State of Indiana, and the U. S. Supreme Court. Mr. Klein was a member of the Society of Automotive Engineers. Previous to his appointment as assistant secretary of the Marmon-Herrington Co. he served in the capacity of assistant to Mr. A. W. Herrington, chairman of the board of directors, then president of the company. His appointment to be assistant secretary of the organization was in recognition of the faithful and effective service he rendered as assistant to the president.

Eric P. Teel, former vice-president and general manager of the Novo Engine Co., Lansing, Mich., died recently. Mr. Teel was prominent in various contractors machinery manufacturers organizations, having held the office of chairman of the Contractors Pump Manufacturing Bureau. Mr. Teel was one of the original organizers of this group and acted as its chairman for a period of 3 years. He came to the Novo Engine Co. in 1908 as shop superintendent and was elevated to the position of vice-president and general manager in 1932 on the death of Clarence E. Bement, his predecessor. Mr. Teel had a wide acquaintance in the construction equipment field not only among manufacturers, but among the many construction equipment distributors throughout the United States.

Van T. Moon, Chief Engineer of the Oklahoma State Highway Commission, died on December fourth in Oklahoma City.

Omaha is Proud...



of this outstanding hotel, noted as the civic, social and travel center of the city. There's far more to enjoy but it is far from being expensive.

HOTEL
FONTENELLE

Official A.A.A. hotel. Home of the National Aeronautic Assn. Headquarters of civic clubs including: Rotary, Kiwanis, Blue Goose, Lions, Optimists, Ad-Sell, Omaha Executives.

Extra Heavy, Olive Color
SLICKER COATS
Here's a rare opportunity to buy the Finest Slickers ever manufactured!

LOOK AT THESE FEATURES
CORDUROY COLLAR • BRASS BUCKLES • CLASP BUTTONS FOR SLEEVES AND INSIDE COAT • NON-RIP POCKETS • REFLEX EDGES KEEP WATER FROM RUNNING INTO FRONT

You won't find any finer or better made Slickers on sale anywhere at this price. We suggest you cover your needs at once while the supply lasts.

For Immediate Delivery
No Priority Needed
While They Last . . .
$3.50 EACH
Medium or Large Size

Order Direct From Dept. RS

1744 J. Jacob Shannon & Co.
J. Jacob Shannon & Company
BROAD & HUNTINGDON STS.
PHILADELPHIA PENNSYLVANIA
"THE OLDEST EQUIPMENT HOUSE IN PHILADELPHIA"

With the Manufacturers

The Heil Co. Announces Plant Personnel Changes

The Heil Co., at Milwaukee, Wis., recently announced two important changes in plant personnel. Herman C. Frentzel, Chief Engineer, has been appointed works manager, and Charles G. Eisenberg has been promoted from chief engineer of the Body and Hoist Division to chief inspector. His work with The Heil Co. for the past 12 years, holding the position of chief engineer since 1938, qualifies Mr. Frentzel for his new duties of guiding and directing the manufacturing facilities of The Heil Co. Mr. Frentzel is a graduate mechanical engineer from Marquette University, in addition to being the recipient of a fellowship from the Metallurgical Division of the University of Wisconsin. In 1930, Mr. Frentzel came to The Heil Co. to take charge of the Oil Burner and Water Systems Division. Later, he went into the company's research laboratory, and during this same period became consulting engineer for the Dehydrating Department, Maintenance Department, and others. In 1938, he was appointed chief engineer, and now takes on a new responsibility as works manager. Through 24 years of experience working with The Heil Co., Mr. Eisenberg has gained an intimate knowledge of the Heil products which qualifies him to interpret their quality requirements. Mr. Eisenberg first started working for The Heil Co. in 1918 as blueprint boy and draftsman. Soon he was advanced to the position of engineer, and then, in 1920, to chief engineer of the Body and Hoist Division. This broad past experience well qualifies Mr. Eisenberg to head the Inspection Department whose job it is to assure close adherence to mechanical, physical, and metallurgical specifications.

More Protection at New York Grade Crossings

The New York Public Service Commission has ordered 44 railroads operating in that state to install additional protection at more than 600 highway grade crossings. All of these crossings are now protected by gates or watchmen but the Commission announced it considers existing warnings inadequate. Additional safety installations ordered include bells, bullseye, lights on gate arms and flashing light signals.

R. S. Patten New AED Director For Region 7

R. S. Patten, General Manager of the Patten Tractor and Equipment Co., Chicago, Ill., has been appointed a member of the Associated Equipment Distributors Board of Directors, succeeding his brother B. C. Patten, who resigned to affiliate with a government agency. The appointment, made by the AED Executive Committee at a recent meeting, is for the balance of the term ending in January, 1943, when the Board of Directors will be elected by the membership at the annual meeting.

Howard Caldwell Serves the Navy

Howard Caldwell of the Caldwell-Baker Company has been aiding the Navy steadily and consistently in its recruiting activities in Indianapolis, home port of his organization. His position as commandant of Indianapolis Ship 42 of the Navy Club, and as commandant of the Indiana squadron has made the work doubly effective.

Mr. Caldwell first joined the navy in 1918 and served at the Great Lakes naval training station where he was selected for officer training and commissioned as an ensign.

"The time I spent in the navy gave me an invaluable confidence and taught me that a man in the navy can go as high as he desires, depending entirely on the will of the man himself," he said recently. "The navy has contributed importantly to a background for my future living."

SALVAGE THOSE CAR TRACKS

THE RAPID PAVEMENT BREAKER is unequalled in performance for breaking out car tracks.

Also used for demolition of—Roads ● Bridge Decks ● Foundations ● Tamping ● Breaking Frozen Ground.

CONCRETE CUTTING CORP. of AMERICA
607 DeGraw Street
Brooklyn, N. Y.

SAVE STEPS IN Saint Louis

STOP AT HOTEL Lennox
DOWNTOWN ON YOUR DOORSTEP
RATES FROM $3.00

AED to Hold 24th Annual Meeting Jan. 11-12-13

The Associated Equipment Distributors will hold its 24th Annual meeting Jan. 11-12-13, 1943, in Chicago at the Edgewater Beach Hotel.

All day Monday the 11th and the morning of Tuesday the 12th the sessions will be for distributors only. Beginning with a luncheon on Tuesday the 12th the sessions will be open to distributors and manufacturers.

Vice-President Ed. P. Phillips, Richmond, Va., is Chairman of the Program Committee and is arranging for a group of outstanding speakers. President T. W. Harron, San Francisco, Calif., will preside and an estimated attendance of 800 is expected. Distributors and manufacturers are urged to bring their wives.

Distributors and manufacturers expecting to attend the AED meeting are urged to make round-trip transportation as well as hotel reservations immediately. AED members should make hotel reservations through the office of G. F. Lowe, 612 No. Michigan Ave., Chicago. Mr. Lowe is a member of the AED Board of Governors.

Worthington Awarded Army and Navy "E"

Worthington production of rock drills, compressors, turbine well pumps, anti-aircraft artillery and airplane parts has reached the stage of "outstanding achievement." On Oct. 22, with an audience of 8,000 assembled in the gun mount division, Brigadier General Guy H. Drewry awarded the "Army-Navy E" to the Holyoke Works for excellence in production. The exercises were attended by 8,000, the largest indoor gathering ever held in Holyoke. Governor Leverett Saltonstall and many notables of the Army, Navy, business and industrial world were present. The program was broadcast with that master director, Lowell Thomas, as Master of Ceremonies. In addition to going out over the Yankee Network, Mr. Thomas, who speaks to the largest coast-to-coast audience on the air, complimented Worthington Pump and Machinery Corp. on its record during his regular evening broadcast over NBC. More than two hundred guests enjoyed a buffet luncheon at the Hotel Roger Smith, Holyoke, Massachusetts, prior to the ceremonies.

Gregory Made Vice-President and Director of Thornton

Bruce Gregory, formerly in charge of sales, of the Thornton Tandem Co. of Detroit, has been made vice-president in charge of sales and a member of the board of directors. Mr. Gregory is well known in the automotive industry. After his graduation from the University of Michigan in 1926, where he was rated a star halfback, he was with the Sales department of the Firestone Tire and Rubber Co. two and one-half years. Following this he was with the General Tire Co. for over nine years, occupying the position of central divisional sales manager when he resigned to enter the field of motor transport. He has been associated with the Thornton Tandem Company of Detroit, manufacturers of Four-Rear-Wheel Drive truck units, for about a year.

Sauerman LONG RANGE MACHINES

Drag Scraper cuts into hill and hauls gravel to screening plant conveyor.

Slackline Cableway cleans out a tailrace, moving thousands of tons of rock from stream to shore pile.

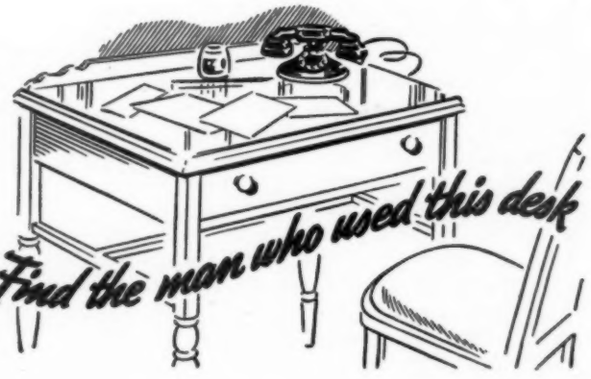
Labor Savers and Cost Reducers

- **Sauerman Slackline Cableways** perform a triple service, digging, carrying, and lifting, when you have a job of making a deep excavation or moving material from a river or pond.
- **Sauerman Power Drag Scrapers** are the world's most economical self-loading and self-dumping units for bank excavating, surface mining and stockpiling.
- **Sauerman Tower Excavators** are unequalled for excavating work that calls for long, continuous cuts as in digging canals, building levees, or strip mining.

Write today for our free catalog—it's chuck full of valuable information on easy ways to do tough jobs where sand, gravel, clay, loose rock and other bulk materials must be dug (or reclaimed) carried, and placed within a range of 1500 feet.

• SAUERMAN BROS., INC. •

588 S. Clinton St. - - - - - - - Chicago, Illinois



He's somewhere in Baltimore or Washington, keeping the business appointments he made by telephone from his room at the Lord Baltimore. He'll be back this evening because he'll be in this territory for several days; because he finds the Lord Baltimore convenient to Baltimore's war industries and official Washington and because the Lord Baltimore is the hotel that suits his rather discriminating taste.

Thinking it over—he could be you!

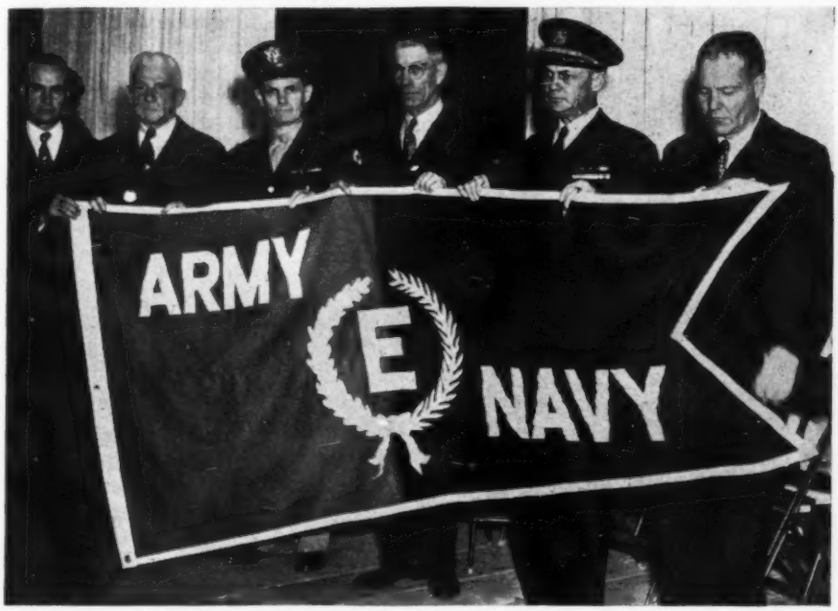
We want you to have the best room available. Wire a reservation and we'll see that you get it.

The LORD BALTIMORE HOTEL

BALTIMORE • MARYLAND

700 rooms—each with radio, tub and shower

Bucyrus-Erie Wins Army-Navy "E" Award



From left to right, the men holding the pennant are: Louis Quarles, who presided at the ceremonies; W. W. Coleman, president of Bucyrus-Erie; Brig. General G. M. Barnes, of the Army Ordnance Department who made the presentation; Robert Scott, employees' representative; Capt. Dallas D. Dupree, U. S. Navy, who decorated the employees with "E" buttons, and N. R. Knox, vice-president of Bucyrus-Erie who accepted the award

In a ceremony highlighted by an impressive salute to members of the armed forces who have given their lives in the service of the country, officers of the Army and Navy presented the coveted Army-Navy "E" award to the Bucyrus-Erie Co.'s South Milwaukee Plant on Nov. 7. Brig. General G. M. Barnes, U. S. Army Ordnance Department, unfurled the "E" banner and paid tribute to the outstanding record of production achieved by the company. Captain D. D. Dupree, U. S. Navy, decorated employees with red, white and blue "E" buttons for accomplishments "above and beyond the call of duty." Addresses in behalf of the company were made by W. W. Coleman, President, N. R. Knox, Vice-President, and Robert Scott, representing the employees. In addition to the production of its regular dirt-moving equipment for use in a wide variety of building activities directly concerned with the war effort, Bucyrus-Erie is engaged directly in manufacturing ordnance material.

HOT SPRINGS
National Park, Arkansas
HELPS with HEALTH

Play your part in America's Victory Program by protecting and increasing your energy, vigor and health. Relax at this famous health spa, in the beautiful Ouachita Mountains. All sports and recreations; two beautiful lakes with more than three hundred thrilling miles of picturesque shoreline.

The Majestic provides unusually fine accommodations, from single rooms to 2, 3, and 4-room apartments for light housekeeping. Government supervised bathhouse in hotel.

DAILY RATES FROM $1.50

Majestic
HOTEL, APARTMENTS AND BATHS
WALTER L. DAVIS, Manager

OVERNIGHT FROM MOST CITIES

Direction: SOUTHWEST HOTELS INC.—H. Grady Manning, Founder
In KANSAS CITY You Will Enjoy Beautiful HOTEL CONTINENTAL

NO Winter FREEZE-UPS

Even though duly delegated manpower may have instructions to provide against power equipment damage or slowdowns resulting from cold weather . . . the human equation can't always be depended upon to make good on its responsibilities.

There is nothing to freeze in a Wisconsin heavy-duty air-cooled engine. AIR-COOLING, and the ability to start easily in any weather . . . to run *continuously* under a full working load, on any kind of job within its power range . . . these are factors that logically make Wisconsin Engines the preferred year-round power.

Model VE-4 V-type 4 cyl. engine. Other types and sizes, 1 and 4 cyl. 1 to 35 hp.

MOST POWER Per POUND
WISCONSIN MOTOR
Corporation
MILWAUKEE, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

Army Officers Visit Caterpillar Plant

Front row, left to right: Brig Gen. Stephen Guy Henry, in charge of the Armored Force School at Fort Knox, Kentucky; B. C. Heacock, President Caterpillar Military Engine Co. and Chairman of the Executive Committee, Caterpillar Tractor Co.; Lt. Gen. Jacob L. Devers, Chief of the U. S. Armored Forces; L. B. Neumiller, President Caterpillar Tractor Co.; Brig. Gen. John K. Christmas, Assistant Chief of the Tank-Automotive Center, Detroit, Michigan. Second row, left to right: Col. M. K. Barroll, Ordnance Department; Col. J. A. Holly, Armored Force Board; Brig. Gen. D. G. Barr, Chief of Staff of Brig. Gen. Henry; H. S. Eberhard, Vice President, Caterpillar Tractor Co.; Capt. B. G. Davidson, co-pilot; Lt. Col. Emerson L. Cummings, Ordnance Department, Detroit, Michigan. Back row, left to right: Lt. Col. L. T. Heath, Armored Force Board; Major E. L. Hormell, pilot; Col. F. N. Thompson, Fort Knox School Staff

Standard Grades of Paving Asphalt Reduced to 17

To provide additional residual fuel for war industries and to conserve transportation, storage facilities and manpower, Petroleum Coordinator for War Harold L. Ickes, Nov. 25 called for discontinuance of the use of slow-curing road oil and requested that the number of grades of petroleum asphalts and surfacing materials manufactured for paving purposes be reduced from approximately 27 standard grades to 17.

Army-Navy "E" With Two Stars to Bantam Bearings

The Army-Navy "E" pennant with two stars, continued recognition for outstanding war production has been awarded Bantam Bearings Corporation, South Bend, Ind. The presentation was made by Lieut. Commander Richard Wagner, of the United States Navy's Midshipmen School at the University of Notre Dame. It was received on behalf of the company by R. B. Nichols, Vice-President and General Manager and Orville Zimmer, President of the Bantam employee's union.

ASPHALT and TAR KETTLES

FIRE PROOF—OIL BURNING
Hand and Motor driven spray.
Many sizes. Write for catalog.

Elkhart White Mfg. Co. Indiana

DIRT MOVING EQUIPMENT

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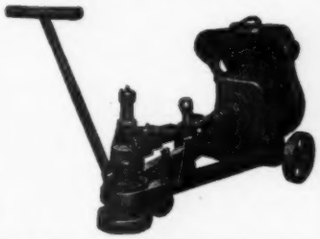

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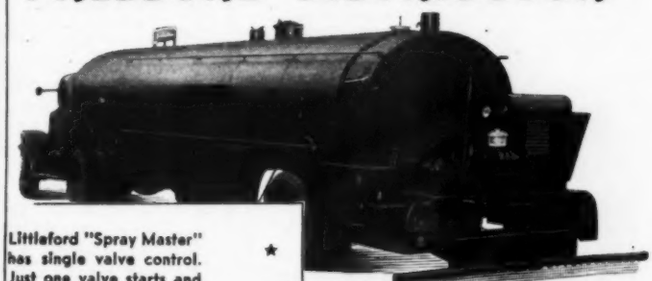

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Majority of War Workers Use Automobiles

The majority of the employees in 12 war plants in 6 States travel to work by automobile, Public Roads Administration of Federal Works Agency reported Nov. 25 on the basis of recently completed war-worker transportation studies in Alabama, Illinois, Indiana, Ohio, Virginia and West Virginia.

Even where plants are situated practically in the center of large urban communities, usually a high percentage of the workers go to work by automobile, the investigations showed. Most walkers were found at an Illinois machine-parts factory and an Indiana wire-goods plant where 51 and 33 percent of the workers, respectively, walk to work and 48 and 59 percent travel by car. One establishment is situated one-eighth mile and the other one-half mile from the center of a city.

The findings indicate the importance of maintaining passenger cars because of the inadequacy of mass transportation facilities. They emphasize also the burden that will be dumped on mass transportation if automobiles are allowed to deteriorate too rapidly, Public Roads officials say.

That workers are not giving "adequate consideration" to walking and to group riding as a means of conserving vehicles and tires is shown by studies of the Highway Traffic Advisory Committee to the War Department which requested the surveys. A majority of the cars will be out of commission by next summer unless their tires are recapped or replaced, according to estimates of the owners employed in the 12 plants.

Average Speed of Automobiles Now 37 Miles

Speed studies in 15 States since the institution of a national 35-mile-an-hour limit show that the average speed of passenger cars on rural highways has been reduced to 37 miles per hour and that of trucks to 36 miles per hour, it was announced Nov. 25 by the Public Roads Administration of the Federal Works Agency.

The new rates represent reductions from prewar averages for passenger cars of 9 and 12 miles per hour in rationed and unrationed areas, respectively, Public Roads officials stated. Corresponding reductions for trucks are 4 and 6 miles per hour.

While average speeds are only slightly above the 35-mile mark, Public Roads Administration pointed out on the basis of the 15-State study that 23 percent of the passenger cars in the rationed area and 31 percent in the unrationed area still travel in excess of 40 miles an hour. In normal times, however, these percentages would be 68 and 80.

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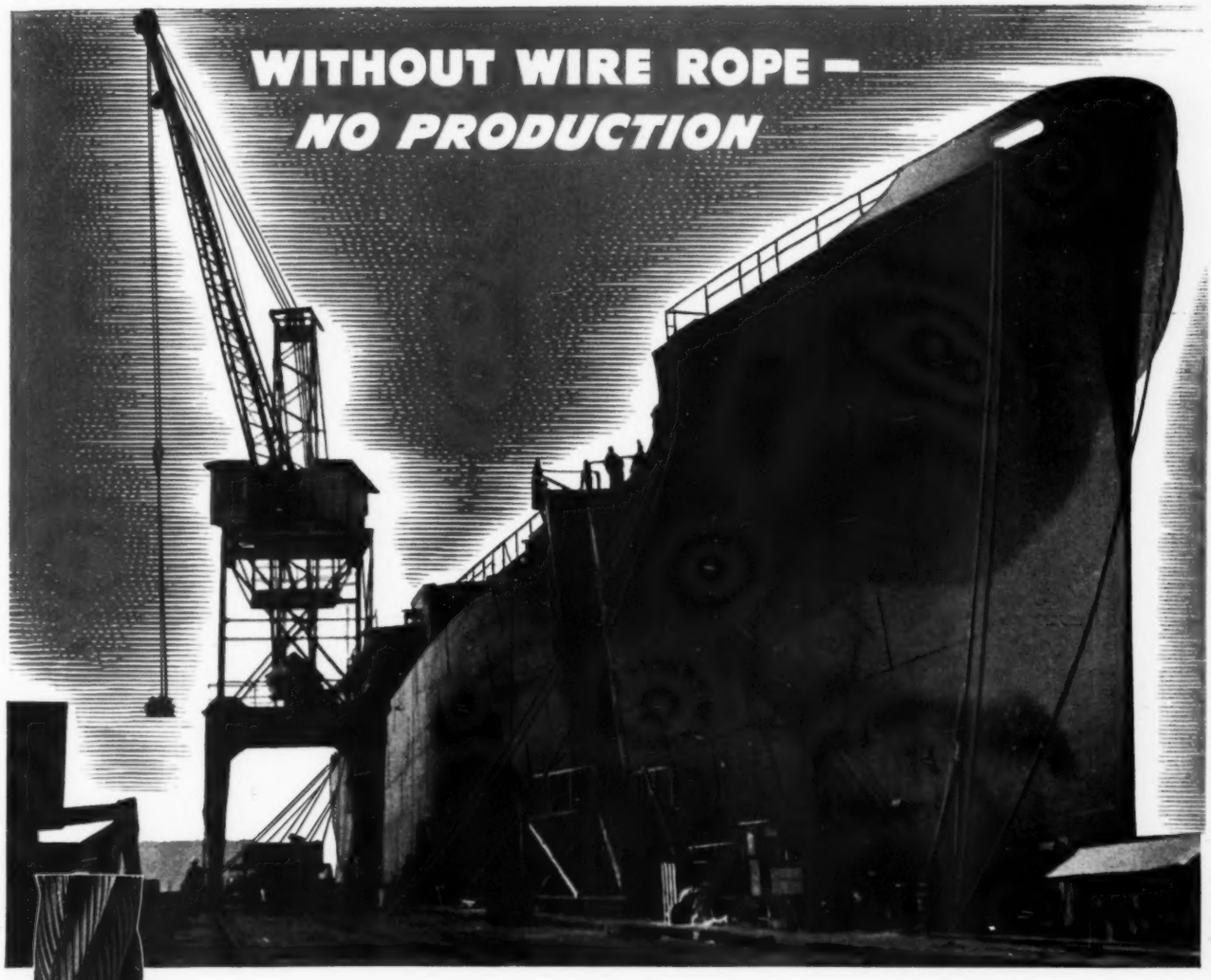

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